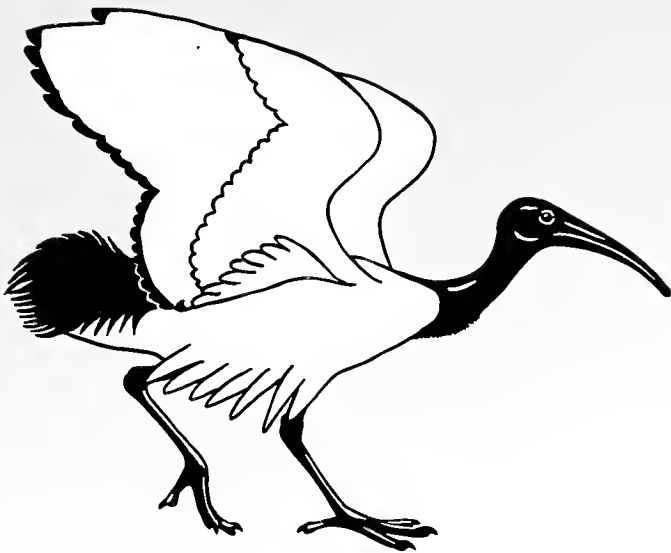
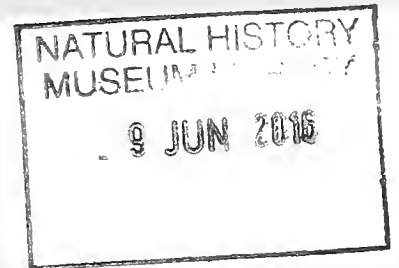


TOS 102

Bulletin of the British Ornithologists' Club



Volume 136 No. 2
June 2016



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FORTHCOMING MEETINGS

See also BOC website: <http://www.boc-online.org>

BOC MEETINGS are open to **all**, not just BOC members, and are **free**.

Evening meetings are in an **upstairs room at The Barley Mow, 104 Horseferry Road, Westminster, London SW1P 2EE**. The nearest Tube stations are Victoria and St James's Park; and the 507 bus, which runs from Victoria to Waterloo, stops nearby. For maps, see http://www.markettaverns.co.uk/the_barley_mow.html or ask the Chairman for directions.

The cash bar opens at **6.00 pm** and those who wish to eat after the meeting can place an order. **The talk will start at 6.30 pm** and, with questions, will last c.1 hour.

It would be very helpful if those intending to come can notify the Chairman no later than the day before the meeting.

Saturday 17 September 2016—One-day joint meeting with the Neotropical Bird Club and Natural History Museum in the Flett Theatre, Natural History Museum, London SW7 5 BD. Programme details will be published in the September Bulletin and on the BOC website (<http://www.boc-online.org>).

The nearest tube station is South Kensington and attendees should use the NHM entrance on Exhibition Road. There is no charge to attend and all are welcome. The programme is planned to comprise six talks, which will be posted on the BOC website <http://www.boc-online.org> about three months in advance.

Access to the NHM is possible from 10.00 am, when coffee/tea will be available adjacent to the Flett Theatre. The meeting will begin at c.10.30 am, with a break for lunch around 12.30 pm—many food outlets are available both within the NHM and local to it in South Kensington. The afternoon session will begin at c.2.00 pm and, including a half-hour break for coffee/tea, should finish by 5.00 pm. The NHM closes at 6.00 pm. For up-to-date details, please check the BOC website: <http://www.boc-online.org>.

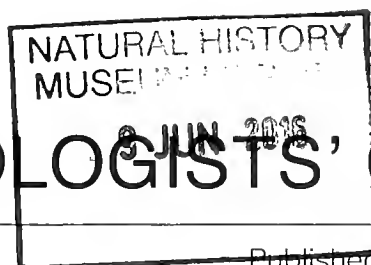
Tuesday 15 November 2016—6.30 pm—Guy Kirwan—*When failure equals success: searching for the Critically Endangered Hooded Seedeater *Sporophila melanops* in central Brazil.*

Abstract: Known solely from the type specimen collected in the 1820s by Johann Natterer, in central Brazil, the Hooded Seedeater *Sporophila melanops* can be considered one of the greatest ornithological enigmas of the Neotropical region. As part of efforts to solve this mystery, Guy Kirwan made two specific searches of the relevant region of Brazil, sponsored by BirdLife International, as well as conducting additional field work in the area during other years. This talk will describe the results of new investigations into the status of Hooded Seedeater, by Kirwan and co-workers (see also *PLoS ONE* 11(5): e0154231), as well as reporting other results stemming from his research into the avifauna of the Araguaia Valley region of central Brazil. A paper describing many of those general avifaunal results has already appeared, in *Bull. Brit. Orn. Cl.* 135: 21–60.

Biography: Guy Kirwan has travelled exceptionally widely throughout South America, especially Brazil, in which country he has spent more than ten years in the field. He is a freelance ornithologist and editor, notably of *Bull. Brit. Orn. Cl.*, with strong interests in avian taxonomy and the breeding biology of birds in the New World tropics. A Research Associate at the Field Museum of Natural History in Chicago and the Museu Nacional in Rio de Janeiro, he currently works for Lynx Edicions on the HBW Alive project.

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Bulletin of the BRITISH ORNITHOLOGISTS' CLUB



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CLUB ANNOUNCEMENTS

The 982nd meeting of the Club was held on Tuesday 15 March 2016 in the upstairs room at the Barley Mow, 104 Horseferry Road, Westminster, London SW1P 2EE. Twelve members and two non-members were present. Members attending were: Miss H. Baker, Mr S. Chapman, Mr G. M. Kirwan, Mr P. Jackson, Mr R. R. Langley, Mr R. W. Malin, Mr D. Montier, Mr S. Pringle, Mr R. Pritchett, Dr R. Prŷs-Jones, Mr N. J. Redman and Mr C. W. R. Storey (*Chairman*).

Non-members attending were: Mrs B. Harrison and Mrs M. Montier.

Dr Robert Prŷs-Jones, of the Natural History Museum, spoke on *The Soul of the Collection: key developments in the documentation of the British Museum's bird collection, 1753 to 1909*. His talk aimed to give an overview of the manner in which scientific documentation of the museum's bird acquisitions developed and improved over the first 150 years from its foundation in the 1750s. It was based on research conducted initially in conjunction with Jenni Thomas, who has already published an overview of the period up to 1836 in *Archives of Natural History* 39: 111–125 (2012) to which interested readers should refer. During its first 50 years, the museum's focus was almost entirely on the acquisition of 'novelties', notably new species, almost all of which went on display. Little interest was shown in associated information beyond generalised locality, many specimens decayed due to poor preparation and the rigours of display, and few details were kept of what was lost or destroyed. This situation persisted into the first 30 years of the 1800s, although on the credit side at least an attempt at the systematic cataloguing of the collection was begun, though this remained both extremely partial and largely unpublished.

It was only in the 1830s that the situation seriously began to improve with, firstly, the appointment in 1830 of George Robert Gray as the museum's first staff member solely responsible for birds and, secondly, as a result of a Parliamentary Committee into 'the condition, management and affairs of the British Museum' that was set up to address perceived gross deficiencies in wider museum management. Key recommendations from this Committee resulted in the setting up in 1837 of the modern museum registration system, whereby every newly accessed specimen was immediately recorded in a standardised format with a unique identifying number, and led to a start in producing and publishing the first systematically arranged scientific catalogues of bird specimens held. However, it was only with the appointment in 1872 of the great Richard Bowdler Sharpe as bird curator that previously slow improvements accelerated to a grand culmination. In the course of less than 40 years up to his death in 1909, he increased the size of the collection by more than an order of magnitude, introduced clear separation between a mounted display collection and much larger bird skin research collection, and wrote a massive history of the bird collection that provides an unrivalled source of information on the collectors of the specimens held. Most importantly, however, he oversaw the production of the great 27-volume *Catalogue of birds in the British Museum* (1874–98), which has been referred to as 'unquestionably the most important work in systematic ornithology that has ever been published'. The bird collection had its 'soul', one still constantly referred to more than 100 years later.

CORRIGENDA

In *Bull. Brit. Orn. Cl.* 136: 14–27, The pigeon names *Columba livia*, '*C. domestica*' and *C. oenas* and their type specimens, the author, Thomas M. Donegan, has drawn attention to a number of errors of commission on his behalf.

On p. 21, the last paragraph should commence: 'The type series comprises: (i) Stock Doves studied by Aldrovandi (1600) and copied by subsequent authors (Fig. 1) and a juvenile Woodpigeon illustrated by Aldrovandi (1600) (Supplementary Materials, Figs. 3C–D), probably near Bologna in Italy...'.

On p. 22, first full paragraph: 'Stable nomenclature is furthered by establishing a lectotype for *oenas* because the name's type series includes Stock Dove, Woodpigeon and Feral Pigeon specimens.'. The fourth paragraph should read: 'Other birds illustrated or referred to in the original description of *oenas* discussed above become paralectotypes as a result of this lectotypification (although at least one and possibly both of Albin's (1738) plates and one of Aldrovandi's (1600) plates are not Stock Doves).'

These changes have no impact on, and indeed reinforce the need for, the lectotype designation for *oenas* in this paper.

Redefining the taxonomy of the all-black and pied boubous (*Laniarius* spp.) in coastal Kenya and Somalia

by Brian W. Finch, Nigel D. Hunter, Inger Winkelmann,
Karla Manzano-Vargas, Peter Njoroge, Jon Fjeldså & M. Thomas P. Gilbert

Received 21 October 2015

SUMMARY.—Following the rediscovery of a form of *Laniarius* on Manda Island, Kenya, which had been treated as a melanistic morph of Tropical Boubou *Laniarius aethiopicus* for some 70 years, a detailed field study strongly indicated that it was wrongly assigned. Molecular examination proved that it is the same species as *L. (aethiopicus) erlangeri*, until now considered a Somali endemic, and these populations should take the oldest available name *L. nigerrimus*. The overall classification of coastal boubous also proved to require revision, and this paper presents a preliminary new classification for taxa in this region using both genetic and morphological data. Genetic evidence revealed that the coastal ally of *L. aethiopicus*, recently considered specifically as *L. sublactens*, comprises two unrelated forms, requiring a future detailed study.

The black-and-white boubous—characteristic birds of Africa’s savanna and wooded regions—have been treated as subspecies of the highly polytypic *Laniarius ferrugineus* (Rand 1960), or subdivided, by separating Southern Boubou *L. ferrugineus*, Swamp Boubou *L. bicolor* and Turati’s Boubou *L. turatii* from the widespread and geographically variable Tropical Boubou *L. aethiopicus* (Hall & Moreau 1970, Fry *et al.* 2000, Harris & Franklin 2000). They are generally pied, with black upperparts, white or pale buff underparts, and in most populations a white wing-stripe. However, the all-black birds inhabiting bushy savanna in northern Kenya and southern Somalia have long been considered as rare morphs of Tropical Boubous in the same areas. Using molecular phylogenetic data for all relevant populations, our aim here is to clarify the relationships of these birds.

Historical context

An all-black form first collected by Fischer in 1878, was originally described as *Dryoscopus nigerrimus*, from a specimen collected at Kipini near the Tana River, Kenya (Reichenow 1879). Subsequently, Reichenow (1905) described another all-black bird from Umfudu on the Juba River, in southern Somalia, as *Laniarius erlangeri*, with reference only to it having glossier plumage than *L. leucorhynchus* (Lowland Sooty Boubou) and *L. funebris* (Slate-coloured Boubou), but without describing any differences from *nigerrimus*. Furthermore, he described a pied bird from Ganala on the lower Juba River as *L. aethiopicus somaliensis*. Van Someren (1922, 1932) questioned, using his own material from Kipini, Manda and Lamu (Kenya), and Juba (Somalia), whether *nigerrimus* and *erlangeri* were not identical species separate from *ferrugineus*. Jackson & Sclater (1938) wholly supported van Someren’s comments on these all-black boubous, stating ‘there can be little doubt that he is correct’ and they listed *L. nigerrimus* for Kenya Colony and Italian Somaliland. Interestingly, Jackson & Sclater (1938) also felt that *L. f. somaliensis* was identical to *L. f. sublactens* (Cassin, 1851). Despite this, Grant & Mackworth-Praed (1944) made no mention of any black forms and simply referred to the two coastal pied forms, *L. ferrugineus somaliensis* and *L. f. sublactens*. In 1947, Stresemann, having compared a specimen of *nigerrimus* and sympatric pied birds,

decided that the former was merely a morph of *sublacteus*. White (1962) treated *erlangeri* as a race of *L. ferrugineus*, made no mention of a black morph, and did not include *nigerrimus* at all. This treatment of two colour morphs of *sublacteus* and *erlangeri* was perpetuated by Ash & Miskell (1998) and Fry *et al.* (2000). In Dickinson (2003) *erlangeri* was considered a race of *L. aethiopicus*, but with no mention of a black morph, or of *nigerrimus*. This history was more fully documented in Turner *et al.* (2011). Importantly, it emphasises the point that there was no field evidence for the decision taken by Stresemann, other than his claim that both forms occurred sympatrically at several localities.

Intrigued by Stresemann's reference to a black morph of *L. sublacteus*, which had only been found in a relatively restricted coastal area, BWF was curious as to why elsewhere throughout the extensive range of *sublacteus*, this taxon is always black above with no white in the wings and all-white underparts, with no evidence of a melanistic morph anywhere else in Kenya. BWF & NDH decided to undertake a field study on Manda Island, as the black morph has been most frequently collected there (Finch & Hunter 2010).



Figure 1. Heads of pied and all-black boubous (*Laniarius*), photographed on Manda Island, Lamu District, Kenya, April 2010; above *sublacteus* and below *nigerrimus*, with the vertical line marking the anterior margin of the eyes (Brian W. Finch)

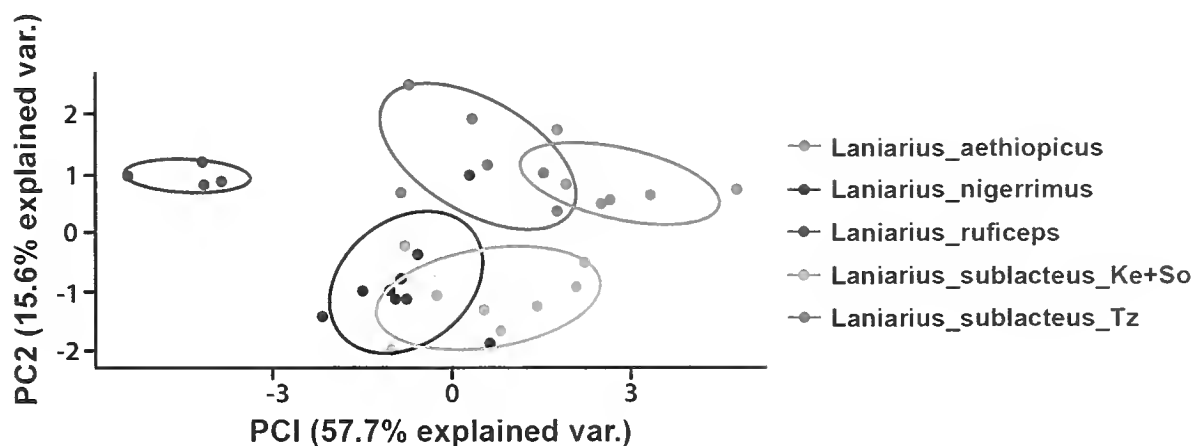


Figure 2. Morphological variation among boubous of East Africa, based on measurements taken by JF & P. Z. Marki. Principal Component 1 represents size (mainly wing and tail); PC2 represents bill parameters. '*Laniarius sublacteus_Ke+So*' comprises specimens from Kenya, as well as two genetically similar birds from Somalia, which, however, differ by having a short white wing-stripe. '*Laniarius sublacteus_Tz*' comprises Tanzanian specimens, formally referred to as '*sublacteus*' but representing another clade (see Conclusions). *L. aethiopicus* represents large birds from the Somali highlands.

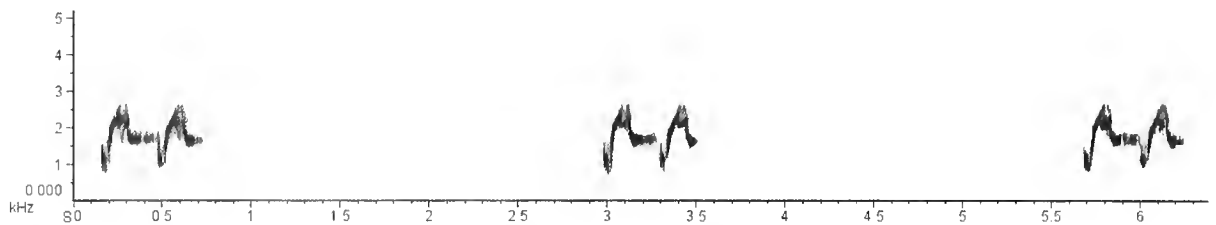


Figure 3a. Sonogram of the explosive two-noted call produced by the all-black *Laniarius nigerrimus*, recorded on Manda Island, Lamu District, Kenya, on 25 April 2010, by Brian W. Finch, using a Sony TCM 200DV recorder and Sennheiser directional microphone. Sonogram created using Raven Lite 1.0 for Windows, and background subsequently cleaned in Photoshop.

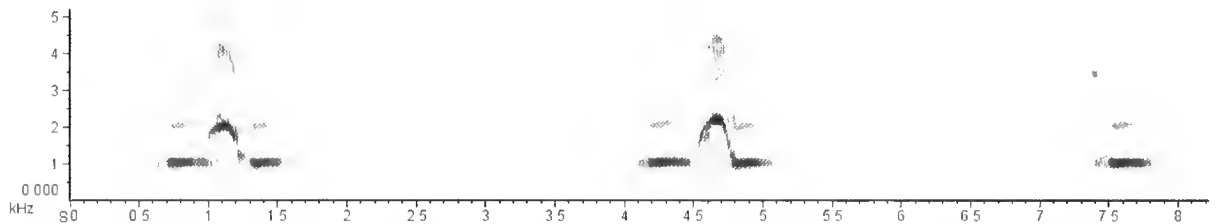


Figure 3b. Sonogram of the three-noted 'bell-like' calls of the East Coast Boubou *Laniarius sublacteus*, recorded on Manda Island, Lamu District, Kenya, on 25 April 2010, by Brian W. Finch, using a Sony TCM 200DV recorder and Sennheiser directional microphone. Sonogram created using Raven Lite 1.0 for Windows, and background subsequently cleaned in Photoshop.

Reappraisal of *Laniarius nigerrimus* based on field and museum studies

Observations were made by BWF & NDH on Manda Island (02°15'S, 40°54'E) from early morning on 25 April 2010 (Finch & Hunter 2010, Turner *et al.* 2011). Almost immediately a deep, throaty call was heard and recorded. The sound was completely unfamiliar to both observers, and on playback an all-black boubou ascended atop a bare tree. After several minutes in the open, it answered the playback with a completely different, and novel, ringing call. On recording this and playing it back, the bird became far more active and flew to the top of another acacia, calling from an open perch. Three very different calls were recorded, all alien to us, and none of them remotely like those produced by the familiar *sublacteus* present at the same locality. Fifteen playback experiments, involving ten pairs of *sublacteus* and five pairs of all-black birds, were undertaken. Using recordings made *in situ* of both forms yielded no response to calls of the other form, although the birds persistently responded to their own calls. This experiment was repeated ten months later in the same area with identical results. BWF & NDH noted that the all-black boubous remained in pairs, mainly in the upper strata of the scrubby woodland, were 'extrovert' (frequently assuming exposed perches, as opposed to the skulking behaviour of the *sublacteus* pairs) and were observed to perform an aerial, parachuting display. Sonograms of the main vocalisations, originally published in Turner *et al.* (2011), are reproduced as Fig. 3.

Over the next two hours we made a detailed description of the differences between the all-black form and *sublacteus*. The differences in morphology, behaviour, vocalisations and habitat are fully described in Finch & Hunter (2010). Among the morphological differences, structurally *nigerrimus* differs from *sublacteus* in bill depth and length. The bill is shorter than *sublacteus*, which results in a much deeper appearance and is very easy to gauge, even in the field; *nigerrimus* has a bill that is equal to or slightly shorter than the distance between the base of the maxilla and the eye. In *sublacteus*, the long and slender-looking bill is obviously far greater than the distance between the base of the maxilla and the eye

TABLE 1
Details of specimens sampled for genetic analyses.

<i>All-black birds</i>								
Museum ¹ registration no.	Lab no.	Locality	Collection date	# Sequences generated	# unique sequence reads mapping to reference mito-genome	Mean read length ²	Mean-fold sequence coverage	Fragments recovered ³
FMNH 200871	B02	Juba, southern Somalia	March 1923	15,341,937	11,872	100	47x	ND2 + ATP6
NMK 12622	B07	southern Somalia	May 1916	9,999,735	6,715	100	22x	ND2 + ATP6
NMK 12619	B08	Manda Island, Kenya	April 1916	11,920,211	6,426	100	21x	ND2 + ATP6
NMK 12617	B09	Manda Island, Kenya	April 1916	9,945,138	4,901	40	14x	ND2
NMK 11650	B10	near Balad, southern Somalia	Jan. 1954	23,266,600	10,090	100	40x	ND2 + ATP6
NMK 12618	B11	Manda Island, Kenya	April 1916	14,878,764	7,562	100	24x	ND2 + ATP6
<i>Black-and-white birds</i>								
Museum ¹ registration no.	Lab no.	Locality	Collection date	# Sequences generated	# unique sequence reads mapping to reference mito-genome	Mean read length ²	Mean-fold sequence coverage	Fragments recovered ³
FMNH 200949	B01	Juba, southem Somalia	March 1923	13,841,061	9,684	100	35x	ND2 + ATP6
FMNH 200950	B03	Juba, southem Somalia	April 1923	21,281,091	13,360	100	55x	ND2 + ATP6
NMK 12487	B04	Mkoi, Manda Island, Kenya	May 1916	15,338,000	7,116	100	24x	ND2 + ATP6
NMK 12498	B05	Kilifi, north Kenya coast	April 1959	28,812,753	14,886	100	64x	ND2
NMK 11614	B06	Kilifi, north Kenya coast	April 1959	28,357,111	15,451	100	67x	ND2 + ATP6

¹ FMNH = Field Museum of Natural History, Chicago; NMK = National Museums of Kenya, Nairobi

² Because of the sequencing chemistry used, 100 bp is the max. read length achievable. The true mean length of mtDNA fragments in the extracts is almost certainly greater.

³ mtDNA fragments as reported in Nguembock *et al.* (2008)

(Fig. 1). In *nigerrimus* the eye appears to be set back further on the head, and the difference could suggest different feeding strategies.

The differences observed in the field are supported by a principal components analysis (see Fig. 2) undertaken by JF & P. Z. Marki. The analysis utilised specimens in Kenya National Museums (Nairobi), American Museum of Natural History (New York), Field Museum of Natural History (Chicago) and Museum für Naturkunde (Berlin). Altogether,

208 specimens from East Africa were examined and Fig. 2 illustrates segregation for 32 specimens for which a full set of measurements were taken, comprising: culmen length to skull, depth and width of bill at level of anterior edge of nostrils, tarsus, hind toe with nail, wing length (flattened against a ruler), length from carpal joint to tip of outer secondary, tail length and length of outer rectrix.

To summarise, not only do the all-black boubous appear glossier and smaller than *sublacteus*, they remain in pairs, inhabit a different vegetation stratum, are not skulking, possess entirely different vocalisations (calls are ringing, but not bell-like, suggesting gonoleks), and an aerial display. Based on this, BWF & NDH concluded that they appeared to belong to a completely different grouping within *Laniarius*. Thus, the van Someren (1922, 1932) hypothesis that the all-black boubous from Manda and Somalia represent the same species needed to be tested molecularly, as recommended by Turner *et al.* (2011, 2013). Nevertheless, Dickinson & Christidis (2014) tentatively elected to award specific status to the all-black birds under the name Coastal Boubou *L. nigerrimus* on the basis of the two just-mentioned papers.

Genetic analysis

Specimens.—A previous molecular study by Nguembock *et al.* (2008) already revealed rather complex relationships among the ‘tropical boubous’, suggesting the requirement to recognise several additional species in East Africa. For Somalia, a tissue sample from an all-black specimen grouped with the unique (black, white and yellowish) *L. liberatus* (named by Smith *et al.* 1991). Although sympatrically occurring pied specimens, initially described as *L. aethiopicus somaliensis*, were not sampled, the presence of a polymorphic species *Laniarius erlangeri* was suggested for southern Somalia. Further, the form *sublacteus* (pied but without a white wing-stripe) was pointed out as a separate species, based on samples from Tanzania, while a single sample from Arabuko-Sokoke Forest in Kenya was also genetically distinct, suggesting cryptic speciation (see Fig. 1a–d in Nguembock *et al.*). The skin collections at the National Museums of Kenya include several all-black specimens from Manda Island, as well as others from Somalia. Furthermore, the Field Museum of Natural History has one all-black and two pied specimens from the Juba Valley, southern Somalia. In total, toe-pad samples were obtained from six black and five pied specimens (Table 1). Our aims were to test if the all-black birds represent one (or more) species separate from the pied forms, and whether the pied form in southern Somalia (*somaliensis*), currently treated as a subspecies of Ethiopian or Tropical Boubou *L. aethiopicus*, differs from pied birds on the coast of northern Kenya (East Coast Boubou *L. sublacteus*).

Methodology.—DNA analyses were undertaken at the Centre for GeoGenetics, Natural History Museum of Denmark, Copenhagen. Historic and ancient samples can largely be expected to contain extremely fragmented DNA (Lindahl 1993) and therefore may not be suitable for conventional PCR-based analyses. Such problems are especially exacerbated when samples have been stored in warm climates. Additionally, analysis of degraded materials is extremely susceptible to contamination from higher quality sources of DNA (Hofreiter *et al.* 2001). Indeed, initial pilot attempts to amplify short (c.100 bp) sub-fragments of the sequences reported by Nguembock *et al.* (2008) using conventional PCR failed (data not shown). Therefore, we elected to generate data using an Illumina shotgun-sequencing approach, in which we would generate many millions of shotgun sequence reads per sample, then use the dataset to unearth the two mtDNA markers published by Nguembock *et al.* (2008), ATP6 and ND2. No attempt was made to recover the nuDNA marker used by Nguembock *et al.* (2008), as such analyses require much additional sequencing. To prevent contamination, the sample extractions and initial manipulations were undertaken

in the 'clean laboratories' at the Copenhagen facility dedicated to working with degraded samples. All manipulation incorporated standard ancient DNA precautions to minimise the risk of contamination, including use of new reagents, protective body suits and sterile gloves, etc. (Hofreiter *et al.* 2001).

DNA was extracted from the toe-pad samples using an extraction method developed for historic/ancient DNA. Each sample was digested overnight at 56°C in 750 µl of custom lysis buffer (0.5 M UltraPure EDTA pH 8.0, 1% SDS [sodium dodecyl sulphate], 10 mM DTT [Dithiothreitol], 1 mg/µl Proteinase K) and then spun through a centrifuge at 13,000 RPM for one minute, thereafter the supernatant was transferred to a new tube and the pellet discarded. Samples were then concentrated on 30K Amicon Millipore Ultra Centrifugal Filters (cut-off size of minimum 50 bp DNA fragments), purified using the MinElute PCR Purification Kit (Qiagen) and finally eluted in 100 µl of EB buffer. Subsequently, the DNA was converted into Illumina sequencing libraries, following the blunt-end ligation approach of Meyer & Kircher (2010). Next, libraries were PCR-amplified using unique indexed primers, prior to pooling at an equimolar ratio, and finally they were sequenced together on one lane of an Illumina HiSeq2500 sequencing run using 100 bp single-read chemistry. Subsequently, the data were analysed as follows. The raw reads from the different sequencing datasets were concatenated into a single fastq file per bird sample. Adapter Removal version 1.5.4 (Lindgreen 2012) was then used to trim adapters from the 3' end of the reads and to cut N's at the end of the sequence and low-quality nucleotides, and to discard reads that after cleaning had a length of <25bp. We then attempted to use the ATP6 nucleotide sequence of *Laniarius f. erlangeri* (NCBI identity EU554471.1) as a reference seed to mine and reconstruct the mito-genomes from all datasets. Initially, this was only successful for samples B02 and B06, so subsequently we re-attempted this reconstruction for the other samples using the now-reconstructed mito-genome from B06 as a new reference.

To reconstruct the mito-genomes, we first created a manifest file for MIRA 4 (http://www.chevreux.org/projects_mira.html), in which we specified the reads as the cleaned reads and the reference as either the *Laniarius f. erlangeri* ATP6 sequence or the B06 assembled sequence described above. Subsequently, we used MIRA 4 to generate an initial mapping assembly that was then used by the MITObim pipeline (Hahn *et al.* 2013). Specifically, the maf file created by MIRA 4 was used for the baiting and iterative mapping using the MITObim.pl script. The reconstructed mitochondrial genome was taken from the unpadded fasta file within the final iteration directory. We used miraconvert to create a consensus sequence of ambiguous SNPs in the assembly. Finally, we annotated the reconstructed mitochondrial genomes using the MITOS (Bernt *et al.* 2013) web server, and downloaded amino acids for the annotated sequences. These were mined for the final ND2 and ATP6 genes to compare with the reference dataset published by Nguembock *et al.* (2008). For phylogenetic reconstruction, we added the ND2 and ATP6 gene datasets to the data matrix produced by Nguembock *et al.* (2008), then aligned each region using MAFFT (Katoh 2013). The resulting alignments were each converted into phylip format using the perl script Fasta2Phylip (Mullins Lab, Univ. of Washington), following which a phylogeny was reconstructed independently for each region using RAxML (Stamatakis 2014) under the GTR+GAMMA model of evolution with 100 bootstrap replicates. Due to our inability to recover both regions from all historic samples, we did not attempt a concatenated analysis of both genes.

Results

Between 9.9 and 28.8 million sequence reads were generated per DNA extract, which after filtering provided average coverage of the mitochondrial genomes between 14 and

Figure 4a. Maximum Likelihood phylogeny of ATP6 mitochondrial DNA subfragments showing the relative placement of the samples studied in the context of the dataset published by Nguembock *et al.* (2008). Sample B09 was not included due to unsuccessful recovery of the ATP6 marker for this sample. Bootstrap support values relevant to the key samples are indicated.

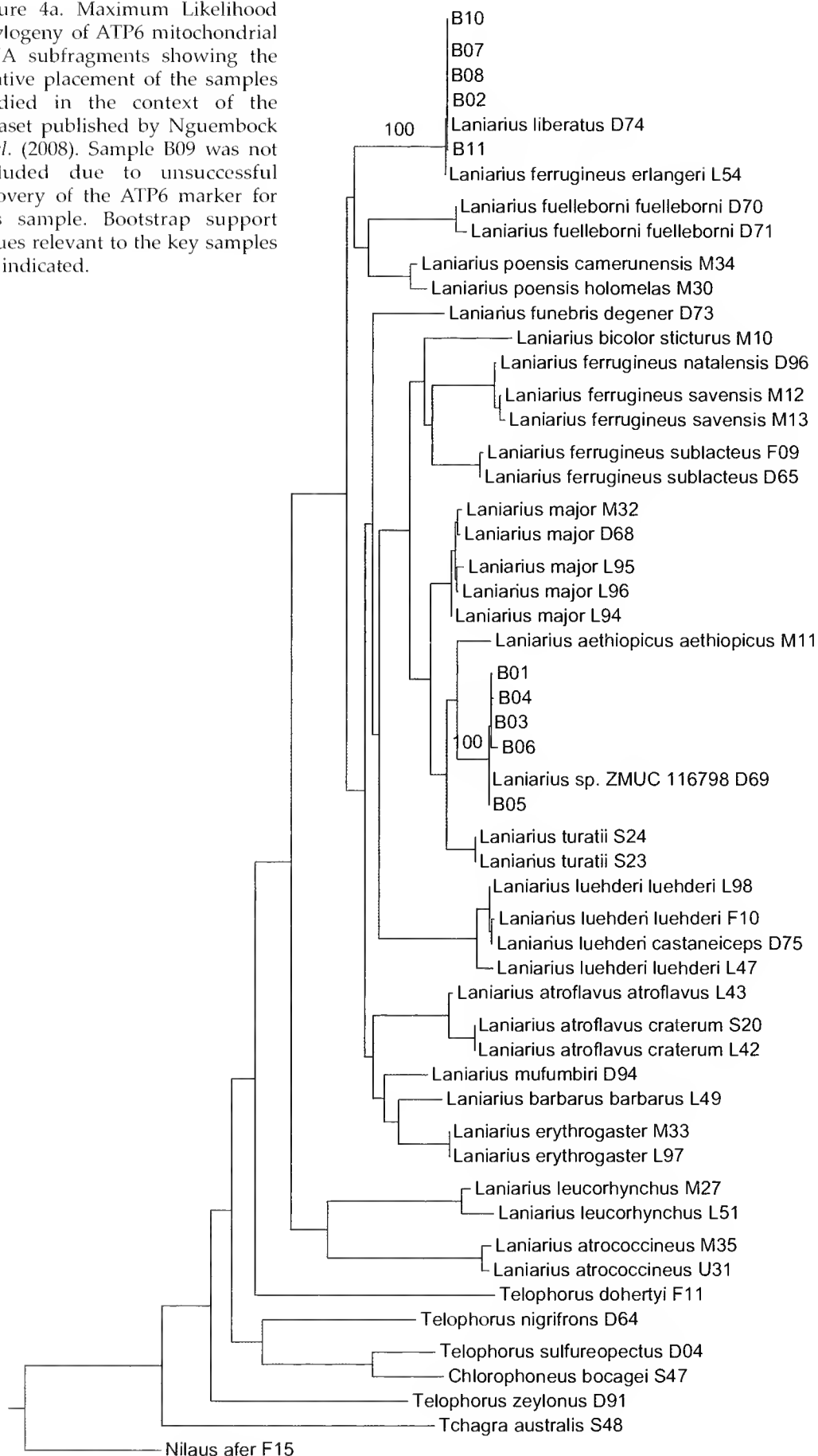
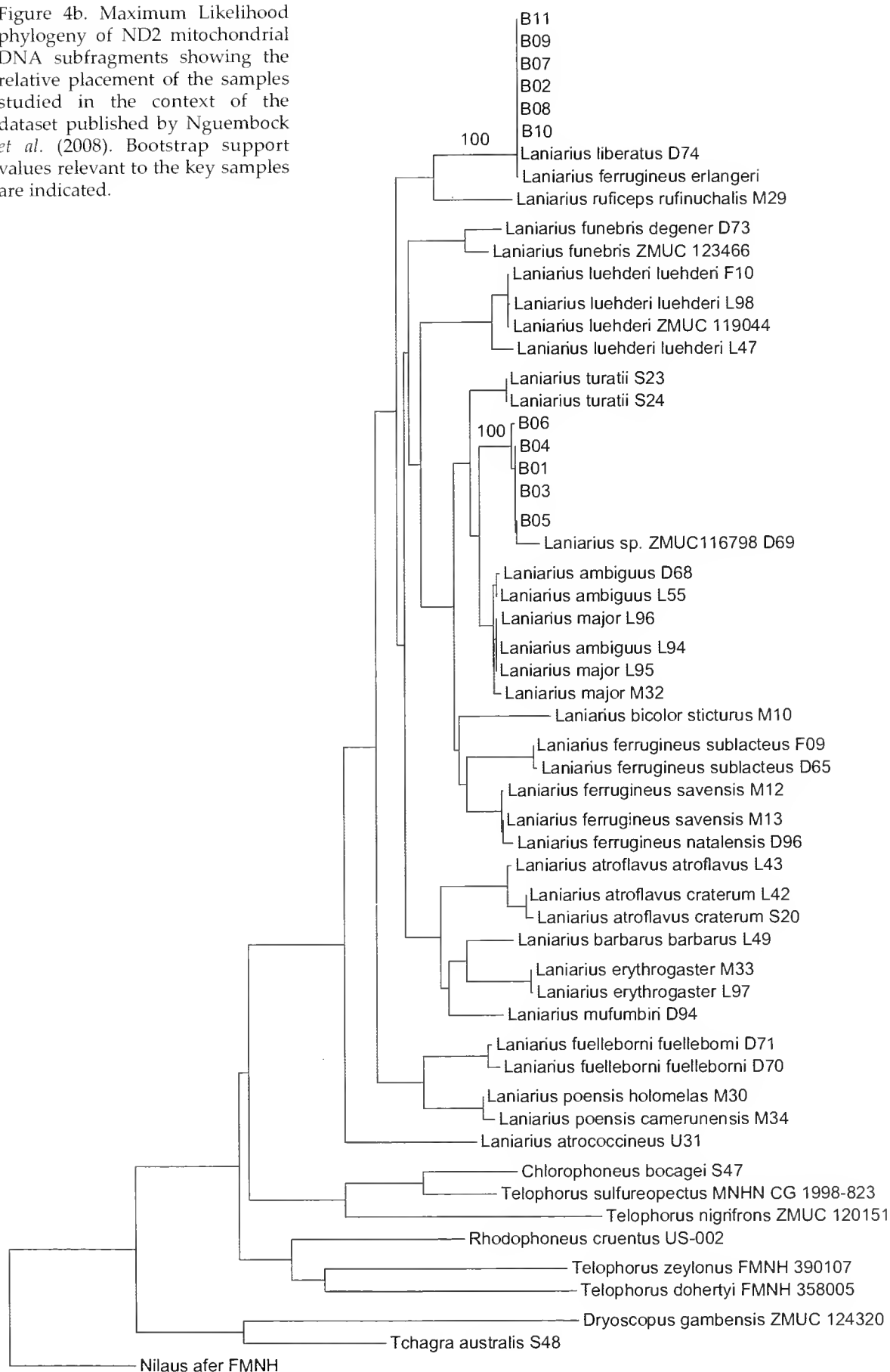


Figure 4b. Maximum Likelihood phylogeny of ND2 mitochondrial DNA subfragments showing the relative placement of the samples studied in the context of the dataset published by Nguembock *et al.* (2008). Bootstrap support values relevant to the key samples are indicated.



67x (Table 1). After trimming the adaptors, the mean read length for most samples was 100, reflecting the max. length that the sequencing chemistry permitted, suggesting that most DNA fragments in the samples were probably longer than this. We recovered ND2 and ATP6 sequence from all samples except B09, in which the ATP6 sequence was too poor to enable reliable sequencing. All new ND2 and ATP6 sequences have been accessioned in GenBank (accession nos. KU905020–KU905040).

The results of our phylogenetic analyses were generally consistent with those of Nguembock *et al.* (Fig. 4a,b), although some differences can be observed. We caution that the focus of our analysis serves only to establish the non-monophyly of *nigerrimus* and *sublacteus* using a neutral maternally inherited genetic marker that has worked well across birds for such specific questions, and unlike Nguembock *et al.* (2008) we did not attempt to analyse any nuclear genes. Therefore, our tree is not intended to accurately represent phylogenetic relationships in the wider context of the groups. With respect to our central questions, the phylogeny indicates that the five all-black individuals that we sampled clustered with high bootstrap support with the single all-black bird sampled (L54) by Nguembock *et al.* (2008) and the uniquely plumaged specimen named as *L. liberatus*. Concerning *liberatus*, Nguembock *et al.* (2008) concluded that the single specimen represents a plumage aberration of the all-black form and is not a hybrid. We agree with that conclusion and reaffirm that *liberatus* be treated as a synonym of *L. nigerrimus*. The all-black birds collected in Kenya and Somalia grouped into one clade, and differed considerably from the pied individuals, which constitute a separate clade.

The pied forms analysed here form a subclade separate from that containing the two Tanzanian samples of ‘*sublacteus*’ in Nguembock *et al.* (2008). More intriguing is that the subclade containing our pied forms also clustered with high bootstrap support with an individual from Arabuko-Sokoke Forest in Kenya (ZMUC 116978), which lies just north of Kilifi. Because this was the only coastal sample from Kenya sampled by the Nguembock *et al.* (2008) analysis and it did not group with the two *sublacteus* specimens from Tanzania, they questioned if there might be yet another boubou species occurring in the forest. Our analyses indicated that the Arabuko-Sokoke sample forms parts of the same subclade as Somali and Kenyan pied specimens, whereas the Tanzanian *sublacteus* samples grouped with the phenotypically quite different *L. ferrugineus*.

Conclusions

Laniarius nigerrimus.—As indicated by our field work and confirmed by genetic analysis, it can be concluded that the all-black birds found in the Juba and Shabeelle valleys, Somalia, and on Manda Island, Kenya, represent a single species, separate from any of the pied forms. The hypothesis that this all-black form represents a morph of any pied boubou species can therefore be rejected. The bird referred to as ‘*erlaugeri*’ (= *nigerrimus*) is almost monomorphic, with *liberatus* representing an apparently one-off variant under present knowledge. The species can be diagnosed as being all black (except concealed grey sub-apical spots on the fluffy rump feathers, with a bluish gloss; bill length to skull 22.8–23.3 mm, wing (flattened against the ruler) 84.0–93.8 mm, tail 79.3–90.5 mm, and tarsus 27.7–32.2 mm.

L. ‘erlaugeri’.—The suggestion that this name refers to a polytypic species is proven incorrect, as *L. aethiopicus somaliensis*, a pied form with a short white wing-stripe, is genetically identical to the northern Kenyan population of *sublacteus*, although the latter has no hint of a wing-stripe. Nguembock *et al.* (2008), who did not sample any black individuals from Kenya, accepted Stresemann’s (1947) view that they are a melanistic form of *sublacteus*.

Our study reveals that inclusion of *somaliensis* with northern Kenyan *sublacteus* results only in a pied and essentially not a polymorphic form.

Nomenclature.—Given that the all-black birds in Somalia and Kenya represent the same species, protocol demands that their scientific name should be that bestowed by Reichenow (1879), i.e. *Laniarius nigerrimus*. The name *erlangeri* is a junior synonym, as it was not introduced until 1905. This leaves the question of an appropriate English name. Although Dickinson & Christidis (2014) coined Coastal Boubou for *nigerrimus*, we prefer Manda Boubou. Firstly, our work on Manda Island was critical to unravelling this taxonomic conundrum. Secondly, the boubou's range is limited, it being currently known in Kenya only from Manda Island and just inland of Ras Tenewi (on the mainland coast 25–30 km south-west of Manda), and the valleys of Juba and Shabeelle in Somalia. Given the military conflict in Somalia and the very widespread use of illegal charcoal to fund this, *L. nigerrimus* may be under real threat from habitat loss. In Kenya, Manda forms part of the Lamu archipelago, the location for a new commercial port development. Currently, Manda Island still supports good habitat for the boubou, but it is largely unprotected. There is an urgent need to establish a conservation unit there. Naming the species for Manda should hopefully give impetus to establishing such a reserve, which is likely to prove easier than at Ras Tenewi.

Pied forms.—Conventionally, *Laniarius sublacteus* refers to the pied boubou that occurs on the coast of Kenya from Boni Forest at the border with Somalia to slightly south of Dar es Salaam, in Tanzania, and inland to Makindu, Taita, the North Pare Mountains, the Usambaras, Ulugurus and Mpwapwa (Britton 1980), a range subsequently extended to include the Rubeho and eastern Udzungwa Mountains in central Tanzania (Fjeldså *et al.* 2010). Similarly, *L. aethiopicus somaliensis* refers to the pied boubou of the Juba Valley in Somalia. Our analysis indicates that there is no genetic difference between *somaliensis* and *sublacteus sensu stricto* occurring north from Kilifi, Kenya, including the Arabuko-Sokoke specimen included in Nguembock *et al.* (2008). However, when we combine our results with those of Nguembock *et al.* (2008) with respect to their two *sublacteus* specimens from Tanzania, at Kwizu, South Pare Mountains (in secondary forest at 04°07'S, 37°51'E, at c.1,400 m) and Korogwe District, West Usambara Mountains (Ambangulu Tea Estate, 14.5 km north-west of Korogwe), they fall into a different subclade. Therefore, the *sublacteus* group contains two distinct forms, which finding clearly demands further research.

To correctly name the northern population of '*sublacteus*', we are faced with a dilemma. Having ascertained that the range ascribed to *sublacteus* is occupied by two different forms, which one is represented by the type specimen of *sublacteus*? This specimen is at the Academy of Natural Sciences, Philadelphia, and was described in 1851. Its provenance is confused, with 'Eastern Africa' (Cassin 1851, Sclater 1930), 'Mombasa' (Grant & Mackworth-Praed 1944, Mackworth-Praed & Grant 1955, 1960) and 'Lamu' (Grant & Mackworth-Praed 1947) all having been suggested. As the true origin is vague and apparently contradictory, the only solution would appear to be a genetic assessment to determine whether it belongs to the northern or southern clade.

Turner *et al.* (2013) already suggested that work was needed to determine if the pied boubous south of Mombasa and inland are separate from those north of Mombasa, as their vocalisations appear to differ. In this respect, note that Fig. 3b represents the pied boubou found from Kilifi northwards. The sonogram depicts the typical three-noted call, which is given in duet. The male utters the first note, the female the second one and the male the third. When the female does not issue the second note, the male does not respond. There does not appear to be much variation in this duet, unlike some boubous such as *L.*

aethiopicus major. However, this vocalisation may prove to be just one significant indicator, when future study of the *sublactens* group is undertaken.

The previous treatment of Tropical Boubou *L. aethiopicus* and Erlanger's Boubou *L. erlangeri* has been shown by Nguembock *et al.* (2008) and by us to be an over-simplification. For Somalia and the East African coast, it is now pertinent to recognise five species: *L. aethiopicus* (northern Somalia), *L. nigerrimus* (southern Somalia and northern Kenya coast), *L. sublactens* (comprising two unrelated taxa, one of them unnamed, along the southern Somali, Kenyan and Tanzanian coasts) and *L. mossambicus* (southern Tanzania, previously also treated as a subspecies of *L. aethiopicus*).

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***Pampusanna* vs. *Pampusana*: a nomenclatural conundrum resolved, along with associated errors and oversights**

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SUMMARY.—The recent split of the genus *Gallicolumba* prompted a reassessment of its synonymy, revealing that *Pampusana* Bonaparte, 1855, is available to replace both *Alopecoenas* and subgenus *Terricolumba*, while *Pampusanna* Pucheran, 1854, is a synonym of *Gallicolumba*. We also show that the original publications of their type species should be shifted, from *Columba pampusan* Quoy & Gaimard, 1824, to *Columba Pampusan* Gaimard, 1823, in *Pampusana* and *Pampusanna criniger* Pucheran, 1853 [= 1854] to *Peristera crinigera* Reichenbach, 1851, in *Pampusanna*. The index pages of Reichenbach (1851) are very rare and a copy is reproduced herein, along with two plate variations demonstrating that despite frequent reference to plates and figures in Reichenbach's earlier works, new names there are based on the index pages intended to accompany the plates, and that any captions on plates were handwritten. Additional names also required earlier citations and other errors and oversights are documented, as well as bibliographical corrections and clarifications.

When Prince Charles Bonaparte returned from exile to Paris in 1850 he was keen to expand his ideas of the classification of birds (Stroud 2000). His developing ideas included the creation of many new genera. One of his generic creations is the subject of this study. Also revealed were overlooked or confused earlier sources for the two species-group names central to it, as well as several bibliographical corrections and clarifications.

Bonaparte's habit of sharing with his colleagues manuscript material featuring proposed new names ahead of publication is at the heart of this case, but there also were extenuating factors. Through the 1850s, H. G. L. Reichenbach, in Dresden, was working on his own avian classification, publishing his results in parts intended to comprise a larger work that was never completed (Zimmer 1926: 505–507). In London, G. R. Gray had finished his comprehensive and influential review of the genera of birds in 1849 (Chansigaud 2009: 147), revised in 1855. All sought to be as up to date as possible. Consequently, some new names were not introduced as intended, causing subsequent problems (e.g. Mathews 1922: 12–17), even until today¹.

One source of new bird discoveries of interest to all three was the collection obtained during the French circumnavigation of 1837–40, notable for the first exploration by French ships of Antarctica. We begin with Pucheran's delayed, final report of the birds recorded during this voyage. He named a new Philippine ground dove, *Pampusanna criniger* (1854²: 118)³, regarded as the prize discovery during a hurried visit to Jolo, in the Sulu archipelago,

¹ Such confusion was not new then and not confined to birds, e.g. Garbino & Costa (2015: 21–22).

² Pucheran's report was first indicated as published on 3 March 1854 (Clark & Crosnier 2000: 414), although hitherto dated to 1853 in ornithological references (e.g. Dickinson & Remsen 2013).

³ There is an earlier citation for this name (see Appendix). The species-group name, a classical Latin adjective, was demonstrated to be more correctly formed as *crinigera* by David & Gosselin (2002: 19), when combined with a feminine genus-group name, in this case, *Gallicolumba*. David & Gosselin (2002: 19) also noted earlier usage of *crinigera* by Hartert (1918), traced to Sclater (1865: 239) who formally proposed emendation of *criniger* to *crinigera* in combination with *Phlogoenas*, before *Gallicolumba* was known to be available (see footnote 12). As we replace Pucheran (1854) as the first citation of this name, *crinigera* becomes the original spelling. David & Gosselin (2002: 19) also noted *Pampusanna* to be masculine because it was originally established with a masculine adjective.

on 21–25 July 1839 (Duyker 2014: 418)⁴. Although Pucheran noted that *Pampusanna* was created by Bonaparte, he adopted the name prior to when it was intended to be published as new by Bonaparte. The preceding new ground dove listed in the report, from New Guinea, was named *Peristera rufigula*⁵. It is obvious that *criniger* was also originally intended to be placed in the same genus. When first published as Pl. 27, more correctly Oiseaux Pl. 27, of Hombron & Jacquinot (1846), they had the same French group name of Péristère. Pucheran did not indicate how he knew of Bonaparte's proposed new name. Perhaps Bonaparte discussed it with him, or Pucheran saw the new name in a manuscript, or heard of the proposed name via a third party. However it came about, he used a different spelling and applied it to a different species.

The first formal appearance with description of Bonaparte's new name, *Pampusana*, was in the sixth and final part of his pigeon review⁶. He introduced the name (1855a: 207) with *Columba pampusan* of Quoy & Gaimard (1824: 121)⁷ as its type species, although emended to *pampusana*⁸. However, Bonaparte first combined *Pampusana* with the adjectival *xanthura* on p. 207⁹ as he interpreted both *xanthura* and *pampusan* to apply to the same species. Temminck used *xanthura* (1839: 81) in his tabular summary and plan of all birds featured in his *Nouveau recueil de planches coloriées d'oiseaux*, wherein he emended spellings of several of his new names and changed others entirely (Dickinson 2001: 25). It has long been assumed that *C. xanthura* was one such emendation, as noted by C. W. Richmond in his index card file (www.zoonomen.net: accessed September 2015)¹⁰. It was intended to replace his original *C. xanthonura* (1823: text to Pl. 190). However, Temminck attributed both forms of the name to 'Cuv.' [= Cuvier] and Cuvier did use *C. xanthura* (1829: 491)¹¹, but clearly as an emendation

⁴ Duyker correctly noted the name as *Pampusanna criniger*. However, whether or not this name represents an indigenous population of ground dove is unresolved (Collar 2006). According to Voisin *et al.* (2005: 863) Sulu was an error for a specimen collected on an island near Mindanao in January 1839. If this type locality is accepted, then the population on Jolo apparently is unnamed, but other interpretations exist, as noted by Collar (2006: 199–200).

⁵ *Peristera* Swainson, 1827, replaced by *Claravis* Oberholser, 1899, not *Peristera* Rafinesque, 1815, is a small group of Neotropical ground doves (Dickinson & Renssen 2013: 65).

⁶ *Pampusana* previously had been used without details (Bonaparte 1854: 140).

⁷ There is an earlier citation for this name (see Appendix).

⁸ Bonaparte, Gray and Reichenbach, but especially Bonaparte, were inconsistent with their spellings of genus- and species-group names, with author credits of names, and other details. For example, the genus-group name *Phlegoenas* is spelled at least three different ways and Richmond (1917: 591) noted seven variations. In addition, authorship of the species-group name *criniger* has been credited to Hombron, Hombron & Jacquinot, Jacquinot & Pucheran, Reichenbach & Pucheran, and finally Pucheran. This was characteristic also of other authors of bird names in this and earlier decades, with a recent study deriving from the reports of a French voyage (Dickinson *et al.* 2015).

⁹ This is the single prerequisite in Art. 30.2.3 (ICZN 1999) to recognise the name as feminine.

¹⁰ C. W. Richmond's index cards of new names was compiled during his time at the US National Museum, now National Museum of Natural History, in Washington, DC, USA, from 1889 until his death in 1932 (Richmond 1902: 663; from 1897 in Stone 1933: 9), and continued for some years afterwards by various contributors. The index cards remain in Washington but are accessible as microfiche (Richmond 1992) or at www.zoonomen.net. It was an ongoing project but although a useful reference does not meet Art. 9.4 of ICZN (1999) as a publication for nomenclatural purposes (*cf.* Dickinson *et al.* 2011: 64) and there are omissions. For example, Wagler's 1829 use of Forster's *C. xanthura* (see footnote 11) is not mentioned, but the name is cited to a later work credited to Forster; Salvadori's *Pampusan* variant is not listed. However, Richmond did note dual publication of names associated with Quoy & Gaimard (1824) that have not been corrected fully until now (see Appendix).

¹¹ What is usually overlooked is that J. R. Forster's MS name, *Columba xanthura*, also was published in 1829 (Wagler 1829: col. 739) based on a bird from Tanna, Vanuatu, making it a synonym of *Columba tannensis* Latham, 1790 (*cf.* Salvadori 1893: 127). However, Cuvier's emendation came first as his book can be dated as before 11 April 1829, whereas part 7 of *Isis*, containing Wagler's paper, dates from July 1829. Each volume of *Isis* was published in monthly parts, which at that time appeared on schedule (*cf.* Mathews 1925: 31, 69).

of Temminck's *C. xanthonura*. Bonaparte, on the other hand, treated *C. xanthonura* as a separate species but renamed it *Pampusana rousseau*, after Temminck's French name for *C. xanthonura*, Colombe Rousseau.

Bonaparte (1855a: 221, 1855b: 88–89) placed *criniger* and *rufigula* in *Phlegoenas* (or *Phlogœnas*) the name in use until replaced by the previously overlooked *Gallicolumba* (cf. Richmond 1917: 591¹²), and both have the same type species, *Columba luzonica* Scopoli, 1786. Moreover, both were indicated as originally described in *Peristera*, thus no mention of Pucheran's *Pampusana*. Bonaparte (1855b: 88–89) dated *Pampusana* to '1853'. This could refer to *Pampusana*, but more likely to his earlier use of *Pampusana* (Bonaparte 1854: 140), which was possibly available in 1853, according to Hartlaub (1854: 34), who also noted *Pampusana* as new on p. 65¹³. Otherwise only the 1854 paper is cited, e.g. Gray (1856: 63), also where Pucheran's name is spelled *Paupusana* and Bonaparte's usage not mentioned. Otherwise, there are no details to indicate what Bonaparte actually meant, and his p. 89 is dated 15 December 1854.

In the final addenda to his pigeon review, Bonaparte (1856: 947) reconsidered his type species of *Paupusana* as a juvenile *Columba erythroptera* J. F. Gmelin, 1789. For many years, *erythroptera* was widely applied to Pacific populations, as demonstrated by its frequent appearance in synonymies (cf. Salvadori 1893: 599–606). This broad application of *C. erythroptera* in earlier works perhaps swayed Bonaparte's interpretation.

Salvadori (1893: 583) recognised the change by introducing the emendation *Paupusau*, type species *C. erythroptera*, but this application of *Pampusau* creates another problem. *C. erythroptera* is also the type species of *Terricolumba* proposed by Hachisuka (1931: 24) for a group of ground doves usually included with *Gallicolumba*. Hachisuka's main source was Mathews (1927), who had excluded *Pampusana* from his synonymy presumably because he treated it as an extralimital name. Hachisuka subsequently followed McGregor (1909) and cited *criniger* to *Pampusana* (1932: 221).

Fortunately, *Pampusau* was not used after 1899 and under Art. 23.9.1.1 is unavailable (ICZN 1999; all references to articles of the Code pertain to the fourth edition unless otherwise stated). Although *pampusau* was used instead of *xanthonura* as late as 1891 (Wiglesworth 1891: 55), the general view since Salvadori (1893) is that *pampusau* is an objective synonym of *xanthura* = *xanthonura*, a species endemic to the Mariana and Caroline Islands, Micronesia, whereas *erythroptera* applies to a species in the Tuamotu archipelago and the Society Islands of Polynesia (Mathews 1927: 74–75, Peters 1937: 136–137).

¹² In the spelling variations noted by Richmond (1917: 591, footnote 2) he included the oldest name, *Plegoenas*, citable to Reichenbach (1851: [i]), according to his card index and verified here (see Fig. 3). The citation has been overlooked, except in a later nomenclatural summary (cf. Neave 1940: 810), with other spellings on pp. 717 and 719 linked to the 1851 name. It also occurs in online databases, e.g. www.gbif.org/species/4851733; www.omnilexica.com/?q=plegoenas. Although not stated by either Reichenbach or Richmond, Reichenbach's (1853: XXV) *Phlegoenas* is an emendation of the earlier name. On the other hand, Salvadori (1893: 583) cited the emended *Phlegoenas* to the 1851 Pl. 227, fig. 2479, which is *Columba luzonica*, but there is no name on the plate and Meyer (1879: 47) has no name linked to the fig. number. Riley (1921) recognised *Plegoenas* as the oldest version of the name, although later treating the name in use prior to changing to *Gallicolumba* to *Phlogoenas* (1924: 17), as did Peters (1937: 133), despite noting the 1851 date and citing Richmond's (1917) footnote. An emendation to *Phlogœnas* was made by Sclater (1865: 238, footnote), but this was not always accepted as the correct spelling (e.g. Hartert 1918, who used *Phlegoenas*). Jobling (2010: 310) distinguished between the original 1851 spelling and the emendation *Phlogoenas* but indicated the latter as Reichenbach 1851.

¹³ Hartlaub's annual reviews in this journal were intended to cover a given calendar year, but literature from early in the following year occasionally entered his coverage. For both the Bonaparte and Pucheran publications of concern here, we now know they first appeared in 1854, Pucheran in March and Bonaparte's paper in two parts in May and June. Inclusion with 1853 literature by Hartlaub may reflect his receipt of advance copies or be based on other information, or included for convenience, but pending corroborative evidence, we recognise the 1854 dates.

Salvadori (1893: 583) also omitted *Pampusanna* from his synonymy. He used *Pampusana* in its stead, but combined under it references to Pucheran and Bonaparte, and gave the type species as *pampusan*. However, Salvadori's proposed change of type species is invalidated under Art. 69.1.1 because *pampusan* was not mentioned by Pucheran (1854: 118).

Despite subsequent treatments in the literature, including *Pampusana* used instead of *Pampusanna* for the Philippine species (e.g., McGregor 1909: 61), and *Pampusanna* instead of *Pampusana* for the Micronesian and Polynesian species (e.g., Gray 1870: 247), we are dealing with two names applied to different species.

Peters (1937: 133–134) was first to explicitly list the names correctly, but placed a '[sic]' after *Pampusanna* Pucheran (p. 133) and appended a 'Not *Pampusanna* Pucheran 1853' to *Pampusana* Bonaparte (p. 134). Peters also spelled the specific epithet *pampusan* in error as *pampusana*, as noted by Walters (2003: 238), thus incorrectly claiming it as a type species of *Pampusana* by tautonymy. His error may be based on Bonaparte (1855a: 207), the source of the emendation. By selecting *Terricolumba* as the available subgeneric name, Peters apparently concluded that *Pampusana* is a junior homonym of *Pampusanna*¹⁴.

In addition, Peters (1937: 133–134) raised two other issues of concern. Firstly, he adopted Pucheran's name while querying earlier usage by Reichenbach. Secondly, he cited Gray (1855: 101) as the type species designator for *Pampusanna*, although Gray used *Pampusana*, and followed Gray's designation of '*Peristera criniger*, Reichenb.'. However, Gray's interpretation can be excluded because Reichenbach's *crinigera*, not *criniger*, was then a composite species (including *rufigula*). At the same time, Bonaparte (1855b: 88) noted '*crinigera*, part Reich. et Pucher.', but adopted *criniger* as the species name (see Appendix). Furthermore, Gray's treatment does not represent a first reviser action because he did not explicitly mention *Pampusanna* but instead used only Bonaparte's variant (uncredited) and did not mention Bonaparte's type species of *pampusan* [= *xanthura* = *xanthonnura*]. Thus Art 24.2.1 is not met.

Pampusanna meets Art. 68.3, type by monotypy, not subsequent designation of Gray (1855: 101), as given by Peters (1937: 133), where his confusion is indicated with the origins of the species name as Pucheran or Reichenbach. *Pampusana* meets Art. 68.2, type by original designation. Bonaparte apparently ignored what was done prior to his introduction of *Pampusana*. He did not explicitly state that his name replaced *Pampusanna* and proposed a different type species.

Articles relating to incorrect original or subsequent spellings or emendations, cf. Art. 19, 32 and 33, are concerned with orthographic variants of a name applicable to the same taxon. For example, the hummingbird genus *Basilinna* was subsequently emended to *Basilina*, but these refer to the same type species (Simon 1921: 312). Homonymy does not apply because, under Art. 56.2, there is a one-letter difference in names with different type species.

Peters' (1937: 133–137) use of four subgenera also demonstrated that groups of species in *Gallacolumba* were not closely related, as noted by Hachisuka (1931) and Riley (1921). The detailed analysis by Jönsson *et al.* (2011) proposed a split into at least two genera, with the subgenera *Terricolumba* and *Alopecoenas* of Peters united generically under *Alopecoenas* Sharpe, 1899. This proposal has been adopted by others (cf. Dickinson & Remsen 2013: 66, 68).

According to our assessment, both names are available and are linked to different type species. Following the proposed taxonomic changes of Jönsson *et al.* (2011), who based their nomenclatural decisions entirely on Peters (1937), we have:

¹⁴The rules of nomenclature concerning homonyms at the time were less specific, and examples did not address the one-letter difference in this case (cf. Schenk & McMasters 1948: 42). In ICZN (1999), Art. 56.2 is no different to the earlier versions, i.e. Art. 56(b) in the third edition and Art. 56(a) in the first and second editions (ICZN 1961, 1964, 1985).

Pampusanna Pucheran, 1854, a junior subjective synonym of *Gallicolumba* Heck, 1849, type species *Pampusanna criniger* Pucheran, 1854 [= *Peristera crinigera* Reichenbach, 1851], by monotypy. Masculine.

Pampusana Bonaparte, 1855, the senior available genus-group name for the group currently separated as *Alopecoenas* Sharpe, 1899, and the senior name for subgenus *Terricolumba* Hachisuka, 1931, with type species *Columba pampusan* Quoy & Gaimard, 1824 [= *Columba Pampusan* Gaimard, 1823 = *Columba xanthonura* Temminck, 1823], by original designation. Feminine.

We propose that *Pampusana* Bonaparte, 1855, must replace *Alopecoenas* Sharpe, 1899, as the senior available genus-group name for ground doves in the subgenera *Alopecoenas* and *Terricolumba* Hachisuka, 1931, with *Pampusana* replacing *Terricolumba* as the subgenus for part of this group.

This unusual case is unique in ornithological nomenclature because two valid generic names within the same group differ by just one letter. The evidence presented here demonstrates that while both are available, only one, *Pampusana*, is applicable as a replacement name under the present classification of the group and must replace a junior name currently in use. *Pampusanna* is currently a subjective synonym of *Gallicolumba*. However, as the type species of *Gallicolumba* and *Pampusanna* are closely related (Jönsson *et al.* 2011), the likelihood of *Pampusanna* ever being found to be separable from *Gallicolumba* appears to be remote, and thus no potential confusion exists in our proposed use of *Pampusana*. We emphasise that the evidence demonstrates the case to be essentially no different to any other proposal to replace a junior name in use with a senior, available name, as when *Gallicolumba* replaced *Phlegoenas*.

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¹⁵ Dating of various titles was checked against Dickinson *et al.* (2011) and documented accordingly. Footnotes facilitate interpreting details relevant to this paper and complement or supplement Dickinson *et al.* (2011).

¹⁶ Richmond (1917: 579) identified two editions and assumed that the one with misprints appeared first. The distribution of parts of the work from two printings may explain some uncertainties about part sizes, with the whole work now accepted as appearing in 1850. Both editions can be accessed at BHL. The misprint edition has a typed list of misprints inserted in the front. The name of concern here is unaffected by the misprints.

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¹⁷ Published in parts 2–3, continuously paginated: 2: 105–128, 15 May 1854, 3: 129–152, 26 June 1854 (cf. Mathews 1925: 13).

¹⁸ Cabanis (1855) listed this circulated collation of signature groups in the May 1855 issue of *J. Orn.* Bonaparte's page group 57–120 is therefore dated to 30 April 1855, following Art. 21.3.1 in order to place it before the published date of the *J. Orn.* part. In effect this distribution of signature groups of pages is no different to that of separates and by breaking up the second volume of *Conspectus generum avium* into such groupings during 1855–57 until finally published as a whole, but incomplete due to Bonaparte's death, we have an intercalation of separate publications from this book with Bonaparte's publication of multi-part and individual papers in journals, as well as some journal separates with revisions. MDB is currently investigating the effect of this chronology, which has not always been accepted, on the dating and first publication of Bonaparte's multifarious new names.

¹⁹ Also found in a separately paginated, collated offprint covering all parts of this series in 1931–33 under the general heading; 1933, 33 pp., 12 col. pl., where *Terricolumba* is on p. 2.

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²⁰ See the Introduction, p. 16, of the volume containing Pucheran 1854, for the original notice of publication dates of most of the 36 (of 37) colour plates of birds in pt. 1 of the Atlas. This early source of dates was not mentioned in the revised list of dated livraisons by Clark & Crosnier (2000: 431–435), who dated Oiseaux pl. 27 as 1846 (16th livraison, February), not June 1845, but both sources dated Oiseaux pl. 28 to 1846 (19th livraison, July), not January 1846. The additional bird plate, Oiseaux pl. 31bis, was published in 1854 (27th livraison, March), cf. Clark & Crosnier (2000: 435).

²¹ This report is usually dated to 1848, but it was not published until June 1849, see footnote 34.

²² Not 1853, see Clark & Crosnier (2000: 414).

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²³ The copy in BHL combines the plates of 1847 and 1851 (see Appendix). Of the 53 plates of pigeons featured, Pl. 326 [= 259] is the 46th.

²⁴ Also variously cited, part title: *Avium systema naturale*; its three different components were usually bound together.

²⁵ Date follows Dickinson (2001: 47).

²⁶ Pigeons in vol. 4.

²⁷ Found in front of vol. 1 or at the end of vol. 5 or bound separately. Citations, as here, are to the folio edition, as by Dickinson (2001: 53), but it also appeared in a quarto edition, as did the whole work, and pagination differs with the Tableau. To avoid confusion, priority is given to the folio edition as that most commonly used for citations.

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Appendix: Proposed citation changes

Pampusanna criniger Pucheran, 1854

Salvadori (1893: 587) indicated priority to Reichenbach's (1851) *Novitiae ad synopsis avium*, pt. VI. Later queried by Peters (1937: 133), this was either overlooked or ignored, perhaps due to the work's rarity²⁸. For example, Rothschild & Hartert (1902: 593) were apparently unable to consult it and cited the text of Reichenbach, but mixed the 1851 and 1861 sources, dating the text of 1861 to 1851, with no mention of plates. This confusion of text and / or plates is apparent from consulting references where original citations to names are provided, particularly with Reichenbach's earlier ornithological publications, primarily consisting of three series of colour plates and multiple numbered figures of individual illustrations, accompanied by brief indices. Confusion with his idiosyncratic series of works has done much to diminish whatever value Reichenbach sought to offer in documenting his ideas on bird classification.

To understand Reichenbach's actions in any of his earlier collections of colour plates, published in three series and 12 parts in 1847–54, the accompanying index pages were needed, but they are absent from BHL, for the first two series, which only comprise the colour plates and a brief, separate title page.

Pigeons, along with some families of gallinaceous birds, were featured in two parts. The first is pt. II of the *Synopsis avium* (1847–48), while the second is pt. VI of its sequel, the *Novitiae ad synopsis avium* (1850–51). Both parts are rare but pt. VI is evidently the rarest and its absence from most collections of Reichenbach's works, apparently along with some of the accompanying index pages to other parts, may explain earlier authors citing plates and figures alone. As the plates were not intended to be captioned with names²⁹, relying instead on the index, it is often unclear if the index was seen or not. In the case of pigeons, names were usually cited from the text of 1861–62, which includes the plate and figure details for each species covered earlier, but with changes in some cases.

The BHL copy of the relevant plate of pt. VI has captions along with the figure numbers. We initially thought that Reichenbach had labelled some plate figures but not all. To clarify this, we contacted L. Overstreet, Curator of Natural History Rare Books, Smithsonian Libraries, Washington, DC, to check the original of the plate scanned for the BHL website, and she observed that 'unlike the figure numbers, the names captioning the figures seem to be handwritten not engraved and printed as part of the plate' (*in litt.* 2016). To compare the plate with another copy of pt. VI, we contacted Reichenbach's museum in Dresden, where via M. Päckert we compared a scan of the plate of their copy with that on BHL. Apart from some slight differences in coloration, it is even more obvious that the names on the plate of the Dresden copy of pt. VI were handwritten.

We now believe that none of the plates were originally captioned and any names were added later (see Figs. 1–2 for a comparison of the two copies). M. Päckert (*in litt.* 2016) confirmed that any captions are handwritten: 'We have also revisited the plates and compared different pages of the book. In fact, most plates are labelled, but not all of them are! At a close look one can notice (i) different shades of black of the species names and the numbers—the numbers are more intense on most plates as if the species names had paled in comparison to the numbers. However, on some plates the species names are also in an intense black, so the intensity even differs among plates, (ii) on some plates the species names have been written across the black margin of the plate or even over parts of the illustrations (like *Geotrygon cristata* on the scan of Pl. 259), (iii) one of the plates seemed to be misprinted in a way that the illustrations and the numbers appear a bit blurred—not so the species names written on that plate! Based on all these observations it seems rather likely to us, that the species labels on the plates were handwritten post-print addenda and the species names have

²⁸ As examples of the rarity of pt. VI, it is missing from the set reported by Zimmer (1926: 511). It also was unavailable for examination in the UK (Dickinson *et al.* 2011: 134), and according to S. M. S. Gregory (*in litt.* Feb. 2016), who prepared the accounts of Reichenbach for the latter work, the copy of pt. VI mentioned as being in Geneva 'proved to be a red herring'. A copy can be consulted at www.biodiversitylibrary.org (accessed October 2015), but of the plates and a title page alone. It is from the Smithsonian Libraries (formerly in the Library of Congress) with wrappers from an earlier, unrelated work of Reichenbach, and also includes the 1847 plates, as explained in the text.

²⁹ Reichenbach's first *Novitiae*, pt. IV, *Natatores* (seabirds), of December 1850, began with a few plates containing printed captions but this approach appears to have been quickly abandoned in favour of separately printed index pages. These are evident in the BHL copy, and printed captioning has been confirmed from the plate details in a copy in the British Museum (S. M. S. Gregory *in litt.* 2016).

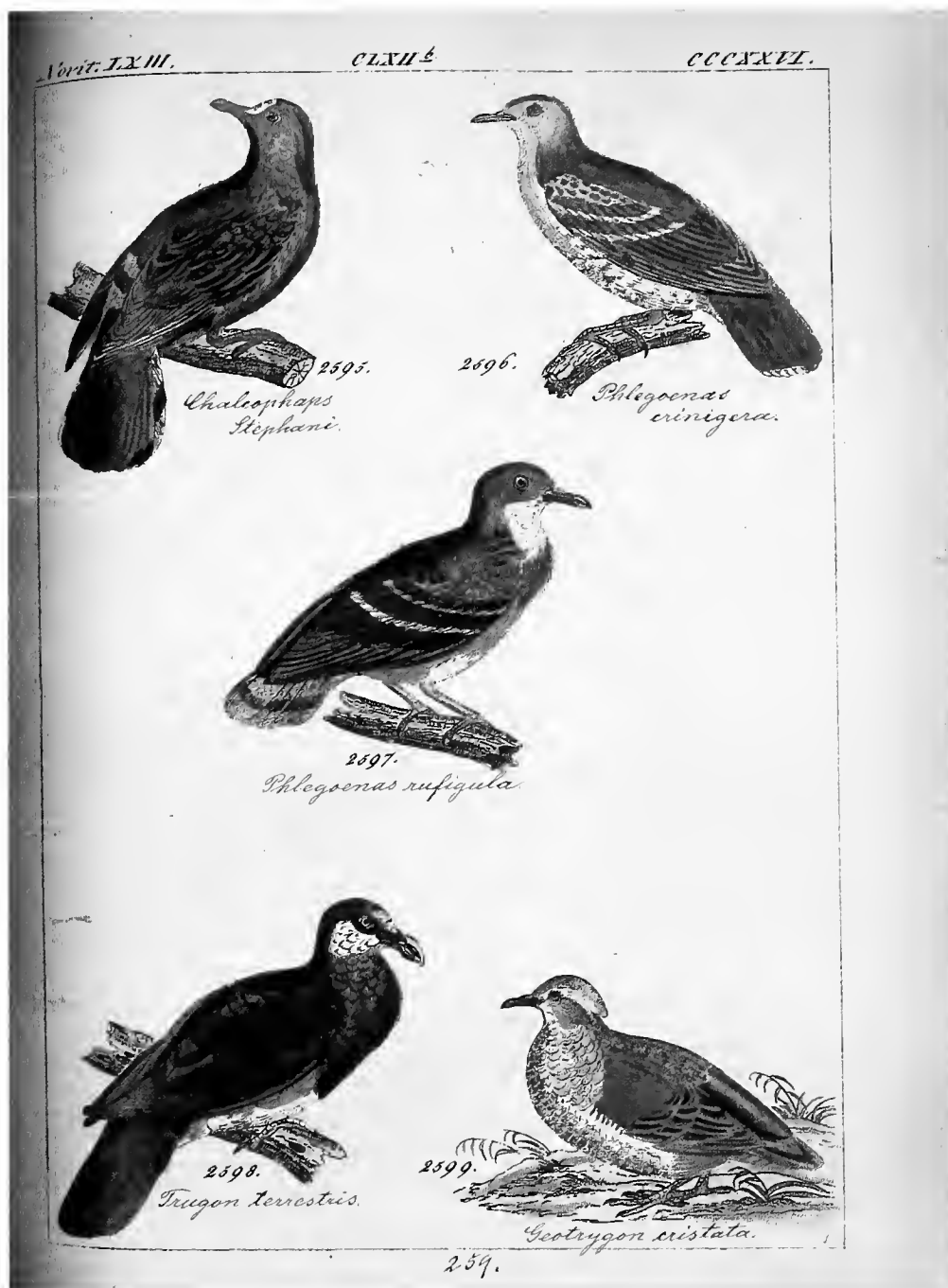


Figure 1. Reichenbach (1851), Pl. 326 [= 259] containing figs. 2595–2597. Dresden copy, demonstrating obvious cursive handwriting and labelled according to Meyer (1879), but partly incorrect (see text). Reproduced with permission of Senckenberg Gesellschaft für Naturforschung, Senckenberg Naturhistorische Sammlungen, Dresden, Germany.

possibly just been falsely attributed to the paintings'. While the plate as a source of new names can be ruled out, what about the text, consisting of two pages forming an index? Again via M. Päckert and his colleagues, we obtained a scan of the very rare and very seldom cited index. Due to its rarity we have reproduced it here (Figs. 3–4). Thanks to her persistent searching on our behalf, Ms Overstreet also tracked down a copy of the index in the Smithsonian Libraries, which confirms our speculation that it was apparently available to C. W. Richmond, yet he only cited two new names from this source in his index cards, while omitting ten others.

Reichenbach's name *Peristera crinigera* first appeared as a plate caption on the second page of his index to pt. VI of the *Novitiae ad synopsis avium*, dated 1 October 1851 (cf. Meyer 1879: vi). As noted by Dickinson *et al.* (2011: 134) the dating concern is with the relevant text, i.e. the indices. These were presumed to be published with the associated plates, which appears correct. M. Päckert also provided the four-page index to the colour plates that formed pt. II of the earlier *Synopsis avium*, dated 1847. Examination of both indices makes it clear



Figure 2. Reichenbach (1851), Pl. 326 [= 259] containing figs. 2595–2597. BHL copy, demonstrating a small type of hand printing, which could be considered to be engraved without close examination, and labelled according to Reichenbach (1851), but partly incorrect (see text). This example also demonstrates that relying only on a digital copy could be problematical, albeit an exceptional case. Image reproduced here as high-quality scan provided via the Digital Programs & Initiatives Division, Smithsonian Libraries, with permission of Biodiversity Heritage Library (www.biodiversitylibrary.org) as digitised by the Smithsonian Libraries (DOI: <http://dx.doi.org/10.5962/bhl.title.102901>).

that the bound collation of colour plates on BHL represents pt. II and VI combined. The index of 1851 only lists the plates added to those of the earlier part.

Salvadori (1893: 587) cited *Peristera crinigera* as dating from the 1851 fig. 2597 (but excluding fig. 2596) of Pl. '259'. However, the figures actually appear on Pl. 326, as noted by Meyer (1879: 49). There is no indication that Salvadori saw the index pages and perhaps the citing of plates alone is based on the index even if this is not mentioned, but it could also be about hand-captioned plates. This difference in plate numbers partly reflects how the work was published. Zimmer (1926: 508) noted pigeons as originally allocated to Pl. 220–277 (see Fig. 4). That there were two series of plates is clear from observations concerning different paper stocks used for plates (Zimmer 1926: 507). The plates are actually part of a three-numbered system. First the *Nov.*

M. VI.

1. October 1851.

NOVITIAE AD SYNOPSISIN AVIUM.

Neueste Entdeckungen und Nachträge
zur
Vervollständigung der Classe der Vögel
bei Erscheinung des Textes.

Columbariae: Taubenvögel.

* Species asterisco notatae ad naturam pictae sunt.

* Die mit Sternchen bezeichneten Arten standen in Natur vor.

- 222.** Nov. LX. CXXXI^b. CCCXXIII.
*2578—79. *Columba Hodgsonii* Vig. proc. 1832.
16. *Dendrotreron* HODGS. 1843.
2580. — *Elphinstoni* FRAS. typ. pl. 59.
2581. — *portoricensis* T. Cuba t. 27.
2582. *Carpophaga*? *inornata* Vig. Cuba t. 28.
*2583—84. *Col. rufo* T. pig. t. 24. *cayennensis*.
BOSSAT.
- 227.** Nov. XLII. CXXXV^b. CCCVII.
*2479. *Plegoenas luzonica* (Col. — SCOP.)
RCHB. *Col. cruenta* GM. TENN. pig.
t. 8. var. *C. nivea* SCOP. *C.*
sanguinea TENN. pig. t. 9. —
Coloenas? *luzonica* GRAY.
2480. *Columba princeps* Vig. JARO. SERB. ill.
n. 5. pl. V.
2481. — *monilis* Vig. BECHTEYS pl. 10.
*2482—83. *Geophaps versicolor* LAPR.
*2484. — *galapagoensis* GOULD Beagle pl.
46. Venus pl. 8.
- 230^b.** Nov. CXXXVIII. CXXXVIII^b. CCCCLXXII.
*3359—60. *Carpophaga aenea* (Col. — L. GM.)
SELB. ♂ ♀ TENN. pig. t. 3. 4.
3361. — *rubricapilla* (Col. — LATH.) RCHB.
Ptilinopus pulcherrimus (Col.
— a SCOP.) GRAY.
3362. *Columba caribaea* LATH. TENN. pig.
t. 10. *C. lamprauchen* WAGL.
3363. *Craspedoenas auricularis* (Col. — T. pig.
t. 21.) RCHB. *Carpophaga*? — GRAY.
- 236^b.** Nov. CXXXIX. CXLIV^b. CCCCLXXIII.
3364. *Ptilinopus Strophium* GOULD. JARD. CONTRIB.
3365. — *holosericeus* (Col. — a T.) GRAY.
3366. — *superbus* (Col. — a T.) STEPHENS.
*3367. — *porphyreus* (Col. — a FORST.) GRAY.
- 240.** Nov. LXI. CXLII^b. CCCXXIV.
2585. *Turtur gelastes* T. S. Jap.
2586. *Ptilinopus Mariae* (Pt. de Marie HERR.
JOUR. Pôle Sud. pl. 20. 2.)
- *2587. *Ptilinopus Du Petit Thouarsii* (Col. — NÉB.
REV. 1840. 289. P. Sud. pl. 29. 1.) GRAY.
2588. — *Clementiae* (de CLEMENTE HERR. JOUR.
Pôle Sud. pl. 20. 3.) RCHB.
- 240^b.** Nov. CXXX. CXLVII^c. CCCCLXXIV.
3368. *Treron psittacea* (Col. — T.) STEPH.
3369. — *fulvicollis* (Col. — WAGL.) GRAY.
*3370. — *calva* (Col. — T.) STEPH.
*3371—72. — *australis* (Col. — L.) STEPH.
- 244.** Nov. XLV. CL^b. CCCVIII.
*2485. *Ptilinopus Du Petit Thouarsii* (Col. —
NÉB. REV. 1840. 289. Venus pl. 7.)
*2486. *Treron ndirostris* (VINOGE — SWS.
West-Afr. II. 205.) RCHB. non
ic. 1348—49. quae *Trer. mili-*
taris juv. et mas adult.
2487. — *crassirostris* FRAS. zool. typ. 60.
*2488—89. *Ptilinopus jambo* (Col. — GM.)
GRAY. fem.
2490. *Calloenas Gouldiae* (Col. — GRAY
HARDW. ind. zool. II. pl. 37.) GRAY.
- 245.** Nov. LXII. CL^c. CCCXXV.
2589. *Ptilinopus Feliciae* (Colombe Felicie
HERR. JOUR. Pôle Sud. t. 12. 1.)
RCHB.
2590. *Zenaida? plumbea* GOSSE Jam. ill.
pl. LXXXV. *Columba* — GRAY.
2591—92. *Treron Sieboldii* (Col. — TENN.
SCHLG. Jap.) GRAY.
2593. *Peristera? puella* SCHLG. Bijdrag I.
*2594. *Calloenas flava* (Colombe jaune HERR.
JOUR. Pôle Sud. pl. 12. f. 2.)
RCHB. — *C. Gouldiae* ic. 1469
— 70. ucc GRAY HARDW. ? —
- 245^b.** Nov. CXXVIII. CL^d. DVII.
*3525—26. *Ptilinopus taiteusis* GRAY. *Colombe*
de Taiti NÉB. REV. 1840. 289.
*3527—28. — *porphyreus* GRAY fem. aut juv.
*3529—30. *Zenaida chilensis* BR.

Figure 3. Reichenbach (1851), index page [i]. The first publication of *Plegoenas*, later emended to *Phlegoenas*. This index is illustrated not only because of its rarity and oversight by the overall majority of authors for the last 150 years, but also to demonstrate how Reichenbach linked his colour plates to form a renumbered series, with all details provided that he thought relevant to support his illustrations and their identifications according to his interpretations. Reproduced by permission of Senckenberg Gesellschaft für Naturforschung, Senckenberg Naturhistorische Sammlungen, Dresden, Germany.

syn. av. number, then an original serial no., and finally one to position the plate within his entire series (cf. Zimmer 1926: 511; figs. 1–2). No. 326, as CCCXXVI, refers to the plate series, as demonstrated by Meyer (1879: 49), while the *Nov. syn. av.* no. is LXIII, and the original serial no. is CLXIIb. All are indicated at the top line of the plate. The series nos. are then linked by the text's *Series tabularum* to the sequence designated for the group (Fig. 4).

By linking *crinigera* to two different figures, Reichenbach (1851: [ii]) created a composite species with what later was named *rufigula*. Bonaparte (1855b: 88–89), Reichenbach (1861: 40–41) and Meyer (1879: 49) recognised this, but reversed the figure numbers in making their identifications. Salvadori (1893) was first to correctly designate the figures to the two species. Under Art. 74.4, Salvadori (1893: 587) effectively designated

- *3531—32. *Chamaepelia Cruziana* D'ORRIG. KNP. Prév. pl. 48.
 *3533—34. *Peristera chalcostigma* RECH.
 253^b. Nov. CXXXI. CLVIII^b. CCCCLXXV.
 *3373—74. *Turtur ceylonensis* RECH.
 *3375—76. *Zenaida boliviana* (Col. — D'ORRIG. LAFR.) RECH. *innotata* HARTL. Rev. 1851. 74.
 *3377—78. *Columbina picui* (Col. — AZARA) GRAY.
 *3379. *Chamaepelia talpacoti* SWS. Col. — TEMM. pig. sp. 68. pl. 12.
 *3380. *Geopelia Maugci* (Col. — T.) GRAY sub *G. cuneata*.
 *3381. *Chamaepelia squamosa* (Col. — TEMM.) GRAY.
 255. Nov. CV. CLIX^a. CCCLXXVI.
 *2863—64. *Columba leucocephala* L. (Aud. Am. pl. 280.
 *2865—66. — *fasciata* SAY. (Aud. Am. pl. 279.
 *2867—68. *Zenaida amabilis* BR. (Aud. Am. pl. 281.
 *2869. — *Trudeani* AUD. Am. pl. 496. *C. leucoptera* L. teste GRAY. nostra ic. 1417.
 257^b. Nov. CXXXII. CLXI^b. CCCCLXXVI.
 3387. *Peristera mystacea* (Col. — T.) GRAY.
 3388. — *erythroptera* (Col. — GN. TEMM.) GRAY.
 3389. — *vinacea* (Col. — T.) GRAY. *C. bicolor* VIEILL.
 3390. — *erythrothorax* (Col. — T. = *larvata* T.) GRAY.
 3391. — *violacea* (Col. — T.) GRAY.
 259. Nov. LXIII. CLXII^b. CCCXXVI.
 2595. *Chalcophaps Stephani* (*Péristère d'Etienne* HMBR. Jcqr. P. Sud. pl. 28. 2.) RECH.
 2596—97. *Peristera crinigera* (*Péristère à gorge rouge* 2596. et *P. crinigère* 2597. HMBR. Jcqr. P. Sud. pl. 27. f. 1. 2.) RECH.
 2598. *Trygon terrestris* (*Trygon terrestre* HMBR. Jcqr. P. Sud. pl. 28. 1.) GRAY.
 *2599. *Geotrygon cristata* (Col. — LATH.) GRAY. *Geotr. sylvatica* GOSSE. *Colombig. versicolor* LAFR. OD.M. t. 47. = 227. ic. 2482—83.
 266. Nov. CVI. CLXXVIII^b. CCCLXIX.
 *2870—71. *Peristera Geoffroyi* (Col. — TEMM. pig. t. 57.) GRAY = *trifasciata* ic. 1430.
 *2872—73. *Turtur simplex* HARTL. West-Afr. 55.
 *2874. *Treron bicincta* (*Vinago* — JERDON Cat. etill. Ind. orn. t. 21.) Col. *purpurea* GN. BROWN. teste GRAY??
 *2875—78. *Chamaepelia passerina* (Col. — L. GN.) SWAINS.
 *2879—81. *Sternoenas cyanocephala* (Col. — L. GN.) BR. AUD. Am. 284.
 *2882—83. *Geotrygon montana* (Col. — L.) GOSSE.
 271. Nov. XLVI. CLXXII^b. CCCIX.
 2491—92. *Penelope albiventris* LESS. rev. 1843. *leucogastra* GOULO Sulph. 48. pl. 31.
 *2493—94. — *boliviana* RECH.
 2495. — *pileata* LICHTST. ODMURS pl. 23. *Sulphiza* — WAGL. *P. catraca* A. PRÉVOST msc.
 2496. *Megapodius Forsteri* TEMM. GRAY gen. t. CXXIV.
 2497—98. *Didunculus strigirostris* (*Gnathodon* — JARD.) GRAY. = 1528.

Series Tabularum.

Die arabische Ziffer ist, wo sie fehlt, unter die Tafeln zu schreiben und diese darnach zu ordnen.		Titel mit 56 Figuren.	
220. Tab. CXXX.	232. Tab. CXL.	244. Tab. CCCVIII.	257. Tab. CLXI.
221. - CXXXI.	233. - CXLI.	245. - CCCXXV.	270. Tab. CLXXII.
222. - CXXXII.	234. - CXLII.	246. - CLI.	271. - CCCIX.
223. - CXXXIII.	235. - CXLIII.	247. - CLII.	272. - CLXXIII.
224. - CXXXIV.	236. - CXLIV.	248. - CLIII.	273. - CLXXIV.
225. - CXXXV.	237. - CXLV.	249. - CLIV.	274. - CLXXV.
226. - CXXXVI.	238. - CXLVI.	250. - CLV.	275. - CLXXVI.
227. - CXXXVII.	239. - CXLVII.	251. - CLVI.	276. - CLXXVII.
228. - CXXXVIII.	240. - CCCXXIV.	252. - CLVII.	277. - CLXXVIII.
229. - CXXXIX.	241 ^b . - CCCCLXXIV.	253. - CLVIII.	278. Natat. 111 ^b . — 111 ^c .
230. - CXXXIX.	242. - CXLVIII.	254. - CLIX.	279. 5. Natat. 111 ^b . — 111 ^c .
231. - CXXXIX.	243. - CL.	255. - CCCLXXVI.	280. Rallinae 197 ^b .
		256. - CLX.	Columb. 65 Tafeln mit 461 Abbildungen.

Gallinaeae.

- 321^b. Nov. CXXIX. CCIII^b. DVIII.
 *3535—36. *Tinamus canus* WAGL. ♂ ♀.
 *3537—38. *Francolinus Coqui* (*Perd.* — A. SM.) RECH. *Fr. subtorquatus* (*Perd.* — A. SM. ill.) GRAY. *Avis teste cl. VERREAUX rarissima, cuius nisi quatuor individua in museis existunt.*
 *3539—40. *Itaginis cruentus* WAGL. *Rarissima avis!*
 365^b. Nov. CXXX. CCXXXIX^b. DIX.
 3541. *Gallus aeneus* TEM. var. GRAY proceed. 1849.
 3542. — *Temminckii* GRAY ib.
 *3543. *Cursorius chalcopterus* GRAY.
 Gallinaeae: 112 Tafeln mit 861 Abbildungen.

Dresden, gedruckt bei Carl Ramming.

Figure 4. Reichenbach (1851), index page [ii]. The first publication of the names *Chalcophaps*, *Stephani* and *Peristera crinigera*. Reproduced by permission of Senckenberg Gesellschaft für Naturforschung, Senckenberg Naturhistorische Sammlungen, Dresden, Germany.

fig. 2597 as lectotype of *P. crinigera*, which is based on the figure of Hombron & Jacquinot (1846), in turn on the specimen collected during the voyage that is still extant (Voisin *et al.* 2005: 863³⁰) as the holotype of Pucheran's *criniger*, and thus also lectotype of Reichenbach's *crinigera*.

In basing his new name on a ground dove from a French voyage, Reichenbach was perhaps influenced by Gray, who had included 19 of the birds illustrated in the *Atlas* of Hombron & Jacquinot (1842–54) in the appendix to the third volume of his *Genera of birds* (1849). Gray identified 11 with previous names but mixed seven with existing generic names and French names derived from the French plate captions in the *Atlas*, including *crinigère* with his recently proposed *Caloenas*, suggesting that he believed them to be new species. Of the seven, two subsequently date from Pucheran (1854: 115, 118), with the third now linked to

³⁰ Voisin *et al.* (2005: 863) used *Pampusana* but correctly applied *Pampusanna* in the paper's résumé and abstract.

Reichenbach (1851), two from Bonaparte (1850a: 60, 1850b: 138; see Pucheran 1854: 93, 108), one from Prévost & Des Murs (1849: 264) and one linked to a Wagler name, but queried by Gray (cf. Pucheran 1854: 106). The 11 identified to earlier names include three of the new species from this voyage reported by Hombron & Jacquinot (1841) and the following addition to Reichenbach (1851). Gray also claimed credit for one of the new pigeons by Latinising its entire French name (*Trugon terrestris*)³¹.

Consequently, *Pampusanna criniger* of Pucheran (1854: 118) must be replaced by the older name of Reichenbach (1851)³², which can be cited as: *Peristera crinigera* Reichenbach, 1851, *Nov. syn. avium*, VI, *Columbariae*, p.[ii], pl. CCCXXVI [= 259], fig. 2597—based on Péristère crinigère, in Hombron & Jacquinot, *Voy. Pole Sud, Atlas*, pt. 1, 1846, Oiseaux Pl. 27, fig. 2, as selected by Salvadori, 1893, *Cat. Birds Brit. Mus.* 21: 587. Type locality not given, but possibly Jolo, Sulu archipelago, or Basilan or Mindanao, or another island in this area (cf. Collar 2006, Voisin *et al.* 2005: 863).

Chalcophaps stephani, usually cited to Pucheran (1854: 119), dates from the same page, indexed to fig. 2595. Gray (1849, App.: 24) referred 'C. (d'Étienne)' to *Chalcophaps chrysochlora*. In this case Reichenbach apparently refuted Gray's identification, as did Pucheran (1854: 121). Reichenbach adopted the same species-group name, which refers to Étienne Stephan Jacquinot (1776–1840), father of Charles Hector and Honoré Jacquinot, who participated in the voyage, Charles as commander of the *Zélée*, Honoré as naturalist. Another pigeon was named for their mother (*Ptilinopus mariae*), cf. Beolens *et al.* (2014: 358, 531). This is the only other new name in Reichenbach (1851) in current use and thus also requires recognition as an earlier source, namely: *Chalcophaps Stephani* Reichenbach, 1851, *Nov. syn. avium*, VI, *Columbariae*, p. [ii], pl. CCCXXVI [= 259], fig. 2595—based on Péristère d'Étienne, in Hombron & Jacquinot, *Voy. Pole Sud, Atlas*, pt. 1, 1846, Oiseaux Pl. 28, fig. 2. Type locality not given, but is New Guinea (west coast), cf. Pucheran (1854: 120) [= Triton Bay, New Guinea, cf. Peters 1937: 116].

Under Art. 74.4, Reichenbach designated fig. 2595, based on the figure in Hombron & Jacquinot (1846), which is based on the first of two specimens collected on the voyage. This is extant, and thus the first syntype of Pucheran's *stephani* (Voisin *et al.* 2005: 858) and lectotype of Reichenbach's *Stephani*. Following Voisin *et al.* (2005: 858), Pucheran's, and thus Reichenbach's, name is restricted to the first syntype. The second syntype, identified as subspecies *mortoni* Ramsay³³, 1882, does not need to be recognised as a paralectotype of nominate *stephani*. Pucheran noted differences in the specimen from the Solomons but did not find it necessary to distinguish the differences nomenclaturally (cf. Voisin *et al.* 2005: 858).

Examination of the two index pages of Reichenbach (1851) reveals that C. W. Richmond, in his card index, only noted two names dating from it. There is actually one other genus-group name and seven additional species-group names originating from this index, but as all are now in synonymy, they are only briefly mentioned here. Most are denoted 'RCHB.' Richmond noted *Plegoenas* (see footnote 12) and *Craspedoenas*, but missed *Trygon* first appearing here, an emendation for *Trugon*. The additional species-group names include some from the French voyage: *Ptilinopus Mariae*, *P. Clementiae*, *P. Feliciae*, *Calloenas flava*, *Peristera chalcostigma*, *Turtur ceylonensis* and *Penelope boliviana*. The 1847 index is also an overlooked source of names but all are synonyms (*Pleiodus*³⁴, *Calloenas*, *Ptilinopus ionogaster*, *Treron multicolor*, *Peristera chrysauchenia*, *P trifasciatus*).

³¹ Gray similarly named their new plover, *Pluvianelle sociable*, as *Pluvianellus socialis* (Gray 1846: 549; see Pucheran 1854: 124).

³² There is no card of this name in Richmond's file, nor of *stephani* (below) for Reichenbach 1851, but the latter's card provided the reference to Rothschild & Hartert (1902).

³³ In recent checklists, this author is usually listed as E. P. Ramsay. Most recent is the fourth edition of the Howard & Moore checklist (Dickinson & Renssen 2013, Dickinson & Christidis 2014). Careful examination reveals only one Ramsay. While some previous works included the author R. G. W. Ramsay, he is correctly listed in the Howard & Moore fourth edition as Wardlaw Ramsay. There can be no confusion between Ramsay and Wardlaw Ramsay and thus adding 'E. P.' is superfluous.

³⁴ *Pleiodus* was intended as a replacement name for *Gnathodon* Jardine, 1845, and as it was usually cited to Reichenbach publications of 1849 or later (e.g. Finsch & Hartlaub 1867: 150), thus *Didunculus* Peale, 1848 [= 1849 = 1845] became the accepted genus-group name of the Tooth-billed Pigeon of Samoa. In 1851 Reichenbach also accepted the priority of *Didunculus* (Fig. 4) and this certainly suggests he also recognised the prior publication of *Didunculus*, as indicated by Salvadori (1893: 626). However, Salvadori's reference to Peale's *Didunculus* by Strickland (1845: 189) is insufficient, but when Peale is quoted via Strickland's report and expanded on by Jardine (1845: 176), *Didunculus* clearly applies to this remarkable pigeon and under Art. 11.6.1, although initially published as a synonym but subsequently used, *Didunculus* must date from its first publication as a synonym. Peale's report on the birds and mammals of the US Exploring Expedition of 1838–42, is usually dated as 1848 in ornithological literature, the date printed on the work itself, but publication actually dates from when 'Seventy copies were sent to the Dept. of State for distribution in the week preceding June 5, 1849.' (cf. L. Overstreet, undated, <http://www.sil.si.edu/digitalcollections/ussex/learn/Overstreet-01.htm>; 'notes in the bibliographic descriptions', accessed October 2015), making publication effectively date from on or after 5 June 1849. Despite the early acceptance of *Didunculus*, in his report that replaced Peale (1849), Cassin alone continued to use *Pleiodus* (1858: 279).

2. *Columba pampusan* Quoy & Gaimard, 1824

What has usually been overlooked, even by Sherborn (1929: 4726), who credited the 1824 voyage report, is that this ground dove was first named in the report of Gaimard's lecture to the Natural History Society of Paris, read on 6 June 1823 and published in July (Gaimard 1823). Thus only four months after Temminck's new name, *xanthomura*, appeared for the same bird. The 1823 report included five other new species names and, probably due to Sherborn's influence, all continue to be cited to the voyage report³⁵, except one that was corrected to the 1823 lecture report (see Dickinson & Remsen 2013). These dual publication dates of the six new names concerned were noted by Richmond and his influence was behind the correction indicated below. They are listed here in the sequence of the 1823 lecture report and can be cited as:

Xanthornus Gasquet Gaimard, 1823, *Bull. Gen. Univ. Annon. Nouv. Sci.* 3: 52. Montevideo and the banks of the Río de la Plata. [A synonym of *Pseudoleistes guirahuro*, according to Hellmayr (1937: 194), who cited the voyage report.]

Dacelo Gandichaud Gaimard, 1823, *Bull. Gen. Univ. Annon. Nouv. Sci.* 3: 52. Papuan Islands [= Waigeo].

Walters (2003: 238) queried the change of type locality to Waigeo, as Quoy & Gaimard (1824) gave Gueba [= Gebe]. However, Mees (1972: 87) had already noted that the types are from Waigeo and apart from Quoy & Gaimard the species is unknown from Gebe. Van den Hoek Ostende *et al.* (1997: 180) listed two syntypes, one male and one unsexed, in the National Museum of Natural History, Leiden, Netherlands [= Naturalis Biodiversity Center]. Voisin & Voisin (2008: 4) listed two syntypes, male and female, in the Muséum national d'Histoire Naturelle, Paris, and noted that the original series comprised two males and one female. Thus according to Voisin & Voisin (2008: 4) the fourth bird in Leiden, identified as female, is of uncertain provenance but apparently contemporary with the types. This despite the Leiden female being identified as part of the type series by Mees (1972). The Paris syntypes are not identified as from Gebe or Waigeo, but merely as from New Guinea. Mees (1972) quoted a letter on the Paris specimens from C. Jouanin, and the association of the specimens with both Waigeo and Rawak [= Lawak = Luwak], a small island near Waigeo, comes from the voyage report, not the specimen data or the old museum register. Selection of Waigeo as the type locality dates to Schlegel (1863: 20), but he only mentioned the male syntype for Waigeo; the second 'syntype' listed by van den Hoek Ostende *et al.* (1997) was not catalogued by Schlegel, but was later catalogued as a syntype, as detailed by Mees (1972). Did the original type series include a second female? This is certainly the implication from both catalogues.

Columba Pinon Gaimard, 1823, *Bull. Gen. Univ. Annon. Nouv. Sci.*, 3: 52. Rawak, one of the Papuan Islands [= Luwak, off Waigeo].

Columba Pampusan Gaimard, 1823, *Bull. Gen. Univ. Annon. Nouv. Sci.* 3: 53. Guam, Mariana Islands.

Podiceps Rolland Gaimard, 1823, *Bull. Gen. Univ. Annon. Nouv. Sci.* 3: 53. Falkland Islands.

Procellaria Berard Gaimard, 1823, *Bull. Gen. Univ. Annon. Nouv. Sci.* 3: 53. Falkland Islands.

Peters (1931: 76) cited *Procellaria Berard* correctly, but on p. 38 *Podiceps Rolland* was cited to the voyage report, suggesting partial input from Richmond, who is acknowledged in the book.

It will be noted that all of the new birds are named for individuals, as indicated by their distinctive formation not only with initial capital letters but also without Latinised suffixes to indicate their eponymous relationship; a French naming style particularly associated with Gaimard. Compare *Megapodius Freycinet* and *M. la Pérouse* published earlier in the same journal (2: 451). In the lecture report all names were identified, except Pampusan: Gaudichaud, Rolland and Berard were associated with the voyage, Pinon was named for Freycinet's wife Rose, who participated in the voyage, while Gasquet was an uncle of Gaimard. Pampusan remains a mystery (Jobling 2010: 290). It is probably a name, but a rare one in France, apparently restricted to the Hautes-Pyrénées³⁶. The implication might be that Gaimard was honouring someone of personal interest to him alone.

³⁵ For a recent example, Walters (2003: 238) provided a summary of the new birds from Quoy & Gaimard (1824).

³⁶ See also <http://www.geneanet.org/search/?name=PAMPUSAN&ressource=relevés>.

A new subspecies of Eurasian Reed Warbler *Acrocephalus scirpaceus* in Egypt

by Jens Hering, Hans Winkler & Frank D. Steinheimer

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SUMMARY.—A new subspecies of European Reed Warbler *Acrocephalus scirpaceus* is described from the Egypt / Libya border region in the northern Sahara. Intensive studies revealed the new form to be clearly diagnosable within the Eurasian / African Reed Warbler superspecies, especially in biometrics, habitat, breeding biology and behaviour. The range of this sedentary form lies entirely below sea level, in the large depressions of the eastern Libyan Desert, in Qattara, Siwa, Sitra and Al Jaghbub. The most important field characters are the short wings and tarsi, which are significantly different from closely related *A. s. scirpaceus*, *A. s. fuscus* and *A. s. avicenniae*, less so from *A. baeticatus cinnamomeus*, which is more clearly separated by behaviour / nest sites and toe length. Molecular genetic analyses determined that uncorrected distances to *A. s. scirpaceus* are 1.0–1.3%, to *avicenniae* 1.1–1.5% and to *fuscus* 0.3–1.2%. The song is similar to that of other Eurasian Reed Warbler taxa as well as that of African Reed Warbler *A. baeticatus*, but the succession of individual elements appears slower than in *A. s. scirpaceus* and therefore shows more resemblance to *A. s. avicenniae*. Among the new subspecies' unique traits are that its preferred breeding habitat in the Siwa Oasis complex, besides stands of reed, is date palms and olive trees. A breeding density of 107 territories per 10 ha was recorded in the cultivated area. Nest sites in trees, palms and shrubs are unique in the Eurasian and African Reed Warbler superspecies. Foraging in oasis gardens is mostly in the tree canopy. There are clear parallels in foraging behaviour and ecomorphology to oceanic island reed warblers. Finally, the biogeographic situation in North Africa, the newly revealed high ecological plasticity of *scirpaceus* taxa, the substantial spatial separation from other reed warbler taxa, and the reasons why these warblers remained undiscovered for so long are discussed.

In the course of comparative studies on the biology and taxonomy of African Reed Warbler *Acrocephalus baeticatus* and Eurasian Reed Warbler *A. scirpaceus* in Libya and Egypt (Hering *et al.* 2009, 2010a,b, 2011a,b, 2012, 2013), three reed warblers with conspicuously short wings were trapped in the Siwa Oasis, in the Egyptian Sahara, in November 2009. DNA analysis revealed that they belonged to the eastern *fuscus* population of the *scirpaceus* complex and were close to the *A. scirpaceus avicenniae* subgroup known as 'Mangrove Reed Warbler', which occurs along the Red Sea (for taxonomy see Leisler *et al.* 1997, Helbig & Seibold 1999, Fregin *et al.* 2009, Kennerley & Pearson 2010). In subsequent years, intensive field studies were undertaken on this reed warbler, which only occurs in the large desert depressions of the Libya / Egypt border region. The results showed several diagnostic characters within the reed warbler superspecies, suggesting that a new subspecies was involved, distinguished by biometrics, habitat, breeding biology and behaviour.

Eurasian Reed Warblers display a complex phylogeographic pattern that has not been completely resolved (Hering *et al.* 2009, Jiguet *et al.* 2010, Procházka *et al.* 2011, Hering *et al.* 2012, Stępniewska & Ożarowska 2012, Winkler *et al.* 2013, Arbabi *et al.* 2014, Winkler *et al.* in prep.). However, relationships among populations north of the Sahara are rather well understood. Two migratory groups occur, comprising nominate *scirpaceus* and eastern

fuscus, and largely sedentary populations currently united into *A. baeticatus*, which occur in Africa and in Iberia (Winkler *et al.* 2013, in prep.). Another form, *avicenniae*, described by Ash *et al.* (1989) and found along the Red Sea as well as in the eastern Sahara, is closest to *fuscus* (Hering *et al.* 2009, 2011a, 2012, 2015).

Material and Methods

Study period.—The initial discovery was made at Siwa, Egypt, on 19–24 November 2009 (JH & H. Hering). From 30 December 2009 to 1 January 2010, and again on 27–28 December 2010, the area around Al Jaghub in Libya was searched for short-winged reed warblers (JH & H. Hering). Thereafter, further studies in the breeding period were conducted on 27 April–3 May 2011 at Siwa (JH, E. Fuchs). The Egyptian oases of Bahariya, Farafra, Dakhla, Kharga (Khārija) and Bāris were explored on 26 December 2011–10 January 2012 (JH & H. Hering). Winter presence in Siwa and the absence of reed warblers in Bahariya were confirmed on 26 December 2012–4 January 2013 (JH & H. Hering). A concluding visit in the breeding season was made to Siwa and Bahariya on 11–21 May 2014 (JH, E. Fuchs & W. Heim).

Trapping.—The necessary trapping to take biometrics and to collect blood samples was undertaken using mist-nets, with the permission of the Administration of the Siwa Protectorate (April/May 2011, May 2014). Measurements and ringing were made in accordance with recent guidelines (Deutsche Ornithologen-Gesellschaft 2011). To attract and trap birds, an acoustic lure was used with the voices of Eurasian and African Reed Warblers (recordings on Chappuis 2000, Schulze 2003), as well as recordings of the local reed warblers. The birds caught in May 2014 were fitted with Helgoland Observatory metal rings. One ringing casualty and one dried corpse are preserved as study skins at the Senckenberg Natural History Collections, Dresden, Germany.

Molecular analysis.—Blood samples were taken from 49 reed warblers mist-netted at Siwa, of which ten were successfully sequenced. Genetic analyses were undertaken at the Konrad-Lorenz-Institut für vergleichende Verhaltensforschung [Institute of Ethology] in Vienna. Blood samples used to classify individual birds came from Lake Neusiedler (*A. s. scirpaceus*), or were made available by S. Fregin (see Leisler *et al.* 1997, Fregin *et al.* 2009) for *A. s. avicenniae* and *A. s. fuscus*, and by V. Salewski for *A. baeticatus guiersi* (Senegal) and *A. s. scirpaceus* (Germany, Lake Constance). We sequenced two sections of the mitochondrial genome, a 594-base section of the cytochrome-*b* gene and 543 bases of the mitochondrial control region II (Bensch & Hasselquist 1999, Singh *et al.* 2008) using standard methods and standard primers, and a primer (for CR II) developed by M. Kapun. BigDye chemistry (Applied Biosystems) was used for all sequencing reactions, and the products were sequenced on an ABI PRISM 3130 9 l automated sequencer (Applied Biosystems). Alignments were produced with MUSCLE version 3.8 (Edgar 2004) and optimised manually.

Bioacoustic analysis.—For recording songs and calls, digital audio recorders Swissonic MDR-2 and Olympus LS3 were used. Recordings were produced in uncompressed wav format with 44.1 kHz sampling and 16-bit resolution. Evaluation was performed in the Tierstimmenarchiv des Museums für Naturkunde, Leibniz-Institut für Evolutions- und Biodiversitätsforschung an der Humboldt-Universität zu Berlin [Animal Voice Archive at the Natural History Museum, Leibniz Institute, Humboldt University, Berlin] using the programme Avisoft SASLab Pro (Version 5.0.14). For all sonograms the following parameters were uniformly selected: sampling rate—22.05 kHz, FFT length—512 measuring points, Hamming Window, and 50% overlap. Recordings made in Siwa Oasis in April / May 2011 and May 2014 can be heard at: www.tierstimmenarchiv.de (Reg. nos. TSA:

Acrocephalus_scirpaceus_DIG0135_01–DIG0135_10 and TSA: Acrocephalus_scirpaceus_DIG0190_11–DIG0190_23).

Results and Diagnosis

Field observations of reed warblers in north-east Africa show that, alongside passage migrants (long-winged Eurasian Reed Warblers *A. s. scirpaceus* and *A. s. fuscus*), birds belonging to *fuscus* that breed in the wider region (Nile Delta and Valley), *A. s. avicenniae* (along the Red Sea), African Reed Warbler *A. baeticatus* (breeding in, e.g., Libya) and Clamorous Reed Warbler *A. stentoreus* (breeding in oases further east, and in the Nile Delta and Valley), there is also an undescribed, short-winged reed warbler taxon breeding in the desert depressions of the Egypt / Libya border region.

Breeding range.—The sedentary short-winged form is restricted to the depressions of Qattara, Siwa, Sitra and Al Jaghbub in the eastern Libyan and Egyptian desert, within just c.20,500 km² of suitable habitat. The stronghold is Siwa Oasis, where the birds nest in reedbeds, but also at high density in date palm and olive gardens. At other oases, inhabited by people like Qara and Al Jaghbub, or uninhabited like Sitra, only stands of reed are used. Nest sites are all 5–55 m below sea level. As all of the unexplored (and currently uninhabited) oases that could harbour reed warblers are in desert depressions, it can be assumed that the entire breeding range of the taxon is below sea level (Fig. 1, Table 2).

Siwa Oasis (Egypt).—Siwa Oasis, with its 18 lakes, 150 artesian springs and extensive oasis gardens, forms the core range (Fig. 2). In the c.28-km broad and 50-km long oasis, which is part of Siwa Protectorate, all large areas of reed as well as plantations of old date palms and olive trees have been occupied by the reed warbler. Nest sites are all 6–20 m below sea level. Qara oasis to the north-east is c.100 km distant, while Al Jaghbub oasis to the north-west is 110 km away and Sitra oasis to the south-east is c.150 km.

Qara Oasis (Egypt).—In this isolated oasis, on the western edge of the Qattara Depression, the reed warbler was found at 55 m below sea level in an extensive reedbed. There was no evidence of it in the few open oasis gardens.

Al Jaghbub Oasis (Libya).—The Al Jaghbub depression comprises several small areas below sea level, where several sight records of the reed warbler were made and nests were found in stands of reed c.5 m below sea level near the inhabited oasis. The oasis gardens of Al Jaghbub, which are only small in extent, do not fulfil its habitat requirements.

Further sight records of short-winged reed warblers were made in other reedbeds and oasis gardens in Siwa, in stands of reed in Sitra, as well as at Malfa salt lake near Al Jaghbub. As yet no field work has been undertaken at the very isolated El Moghra lake, Qattara Depression, which probably forms the north-east border of the reed warbler's range. There is, however, a record of a single dead 'reed warbler' there (Goodman & Ames 1983), but it appears that the specimen was not preserved, as it is not among the expedition material at the Field Museum of Natural History, Chicago (J. M. Bates *in litt.* 2015). Its real identity thus remains unknown.

It can be assumed that the range of this form is restricted to the large Libyan Desert depressions on the Libya / Egypt border. The evidence for this assumption is that a targeted search of the eastern oasis belt proved fruitless. In December 2011 and May 2014 no records were made during intensive work in the reedbeds and extensive oasis gardens of Bahariya. Negative evidence was also obtained at the other large Egyptian oases of Farafra, Dakhla, Kharga (Khārijja), Bāris, and Wadi Natrun.

Breeding sites of closely related taxa (*A. s. scirpaceus*, *A. s. fuscus*, *A. s. avicenniae* and *A. baeticatus* ssp.) all lie several hundred kilometres away. To the west, African Reed Warbler breeds in Libya, in oases in the central Sahara and near the coast in Cyrenaica, where it is

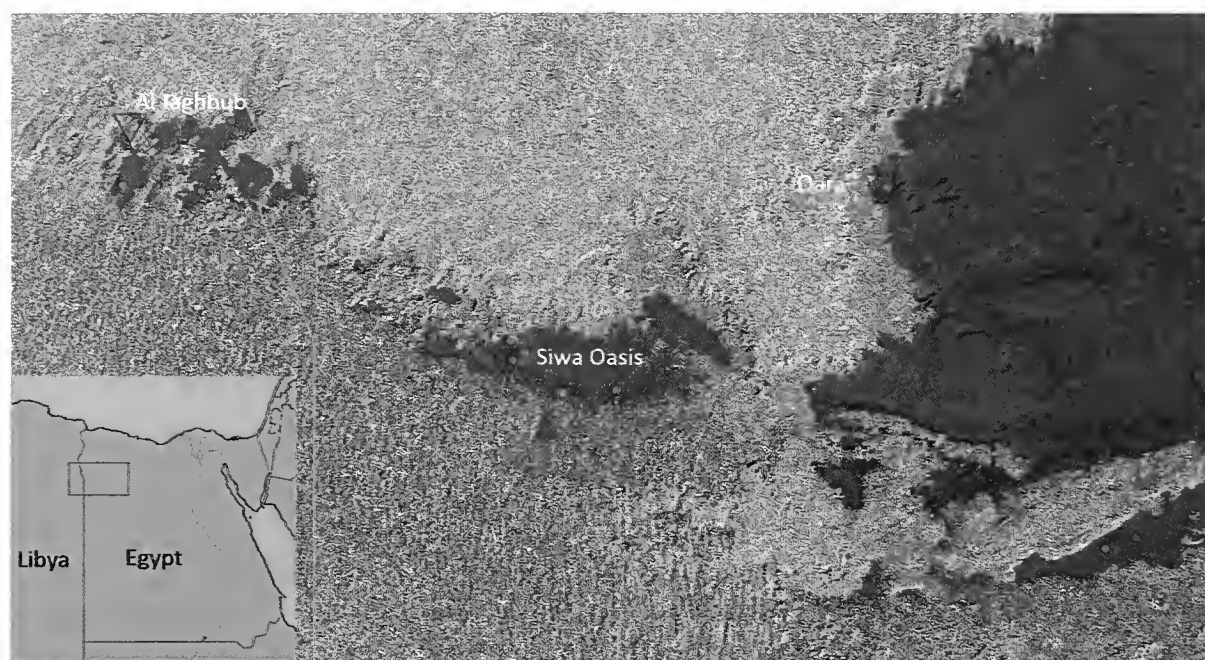


Figure 1. Relief map of the study area with records of the newly discovered taxon shown as red dots. Areas below sea level shown in green. Map constructed from NASA SRTM1 elevation data using the Behrmann cylindrical equal-area projection.



Figure 2. Oasis gardens of Siwa with the Amun Temple, the core breeding range of the newly discovered taxon, Siwa, Egypt, 20 November 2009 (Jens Hering)

sympatric with Eurasian Reed Warbler (Hering *et al.* 2009, 2010a,b, 2011b). It is probable that *Acrocephalus* breeding in isolated oases in south and south-east Libya are also African Reed Warblers (Hering *et al.* 2011a). To the east, Eurasian Reed Warbler breeds in the Nile Delta alongside Clamorous Reed Warbler (Meininger *et al.* 1986, Goodman & Meininger 1989, Ożarowska *et al.* 2011). Recent work has confirmed breeding of *A. s. fuscus* there (JH pers. obs.). Two trapped Eurasian Reed Warblers (wing 64 mm) with brood patches, in Wadi El Rayan south-west of Al Fayyūm, require further investigation (Stępniewska & Ożarowska 2012), but were probably also *fuscus* breeding on the Nile. Recent studies in Egypt have also revealed that ‘Mangrove Reed Warbler’ (*avicenniace*) nests on the Red Sea coast (Hering *et al.* 2012, 2013).

Based on morphological, molecular and ecological differences, as well as in behaviour and song types (see below), when compared with all known taxa in the *scirpaceus* / *baeticatus*

complex, we consider the population of the great Egyptian depression to represent an undescribed subspecies of Eurasian Reed Warbler, which we name:

***Acrocephalus scirpaceus ammon*, subsp. nov., Siwa Reed Warbler**

Holotype.—Adult (sex unknown), Senckenberg Natural History Collections, Dresden, Germany (SNSD) no. 2014/64, dried corpse found near nest site at start of breeding season, Siwa Oasis, Egypt (29°13'16.58"N, 25°25'43.33"E, 16 m below sea level), 12 May 2014, collected by JH, W. Heim & E. Fuchs. Cause of death: assumed exhaustion / dehydration.

Paratype.—Adult female (egg in ovary), SNSD 2014/69, at the same locality and on same date as the holotype, by the same collectors. Ringing casualty due to predation (ring no. Helgoland, Germany [B] 90362139).

Description of holotype.—Forehead, crown (large parts missing), nape and mantle Raw Umber (Smithe 1975, no. 123), merging into more Cinnamon (123A) back to uppertail-coverts. Eye-ring not visible. Lores, ear-coverts and sides of breast Buff (124), contrasting with whitish / off-white chin, throat and upper breast. Lower breast and belly Buff (124), flanks varying slightly between Yellow Ocher (123C), Clay Color (123B) and Pale Pinkish Buff (121D). Thighs Clay Color (123B) with a rusty hue. Vent not well preserved but single feathers have whitish-cream (off 54) tinge. Undertail-coverts (few remaining in holotype) whitish. Scapulars, marginal coverts and centres of median and greater wing-coverts pure Raw Umber (123), fringes of median and greater wing-coverts Clay Colour (123B). Alula as greater wing-coverts but Tawny Olive (223D) fringe. Primaries and secondaries Hair Brown (119A) with Tawny Olive (223D) outer fringes. Proximate half of pp2–7 (counted ascendently) with inner webs diffusely margined whitish grey. Pp8–10 and secondaries have their inner webs entirely fringed whitish grey. Tertiaries Dark Drab (119B, i.e. paler than secondaries) with Tawny Olive (223D) fringes. Leading edge Buff (124), lesser and greater underwing-coverts off-white. Ventral coloration of primaries and secondaries as in dorsal view. Shafts of flight feathers same colour as feather centres, but fractionally darker. Outer rectrix (fresh) off-white on inner web and tip, with Drab (27) centre, shaft darker; growth bars obvious. Remaining rectrices (worn) Dark Drab (119B) with very narrow Tawny Olive (223D) fringes and tips. Underside identical. Bare part coloration (in specimen): maxilla Sepia (119), cutting edges and mandible Drab-Grey (119D). Gape not visible. Tarsometatarsus Brownish Olive horn (29), toes and claws Vandyke Brown horn (121), soles paler (yellowish). For measurements see Table 1.

Variation.—Single paratype very similar to holotype, but upperparts slightly more bleached, breast and belly visibly paler, and flanks Tawny (38) instead of Pale Pinkish Buff (121D) as in holotype. Remiges (except pp2–3, numbered ascendently, and secondaries) and rectrices heavily worn.

Diagnosis.—In the field, the new taxon appears rather small (visibly so vs. *A. s. scirpaceus*, *A. s. fuscus*; shorter winged than *A. palustris*), with brown upperparts, cinnamon rump and uppertail-coverts, yellowish-brown flanks and whitish underparts. Overall coloration, as in other reed warbler taxa, individually variable (Harvey & Porter 1984, Schulze-Hagen 1991). The upperparts can be heavily affected by UV-light / sun exposure and appear bleached to hay colour. Juveniles, like other reed warblers, easily identified by their fresh dark brown plumage, which limits contrast with the cinnamon rump. Song similar to other taxa of the *scirpaceus* / *baeticatus* superspecies and only distinguishable using sonograms (see below). Most conspicuous are the short wings and toes (similar to *A. s. avicenniae*, *A. baeticatus* spp., but see Table 1 for diagnostic differences in measurements; Figs. 12–13). Identification of the live bird in the hand relies—apart from small size and short wings, compared to *A. s. scirpaceus*, *A. s. fuscus* and *A. palustris*—on distinguishable emargination on inner web of

TABLE 1

Standard measurements of two specimens of *A. s. ammon* compared to closely related taxa, using museum specimens (SNSD = Senckenberg Naturkundliche Sammlungen Dresden; ZMB = Museum für Naturkunde Berlin; ZFMK = Zoologisches Forschungsinstitut und Museum Alexander Koenig Bonn; IZH-V = Zentralmagazin Naturwissenschaftlicher Sammlungen der Martin-Luther-Universität Halle-Wittenberg; SMNS = Staatliches Museum für Naturkunde Stuttgart; NHMUK = Natural History Museum Tring). * = weakly developed; abbreviations follow Deutsche Ornithologen-Gesellschaft (2011): Wmax = wing from carpal joint to tip of longest primary (max. chord); tail T1 = from the two innermost rectrices, where their bases emerge from the skin to the tip of the longest feather; bill BSk = from the angle at the front of the skull to the tip; bill BF length of exposed culmen from foremost feathers to tip; bill width BwD = at distal edge of nostrils; bill width BWF = at feathering; Tarsus Tar2 = from back of intertarsal joint to front edge of last undivided scale; hind toe vToeh = taken ventrally, notches of separation of foot from toe-pads to base of claws; central toe vToec = central toe, otherwise as previous; vClh = taken ventrally, claw of hind toe from base to tip; vClc = central toe, otherwise as previous; P1 to P10 = pp1–10 (counted from outer edge of wing, p1 being smallest feather); WT = wingtip; PC = primary-coverts; Kipp index = distance between tip of s1 and tip of longest primary in naturally folded wing; R1 to R6 = rr1 (outer) to 6 (inner); shape of bill = measured against millimetre paper, distance of bill tip to horizontal gape of bill; all measurements in mm.

Author: 1 = aut.; 2 = Ash *et al.* 1989; 3 = (Ehrenberg, 1833); 4 = (Hermann, 1804); 5 = Reichenow, 1908; 6 = (Bechstein, 1798). **Status:** h = holotype; p = paratype; s = syntype; dw = detached wing. **Age:** ad = adult; br = adult (breeding); ju = juvenile; ? = not given. **Sex:** f = female; m = male; ? = not given. **Collected by / Measured by:** AM = A. F. v. Mecklenburg; B = Berg; BA = B. Alexander; BM = BMNH staff; BS = B. Sergevic; CE = C.G. Ehrenberg; DH = D. Heidecke; DP = D. Pearson; EF = E. Fuchs; ES = E. Strassmann; FH = F.W. Hemprich; GN = G. Nikolaus; HB = H. v. Bötticher; HL = H. Lynes; HS = H. Schubatz; JH = J. Hering; RP = R. Plechöck; WH = W. Heim; Z = Zsch. [Mr Zschorn]; ZN = ZNS staff; ? = not given. **Measurements:** (b) = broken; (l) = [lacking]; (m) = [mout]; (nt) = not taken; (w) = [worm].

Genus	Subspecific epithet	Author	Status	Inventory number	Age	Sex	Locality	Date	Collected by	Measured by	Wmax right	Wmax left	Tail T1	Bill BSk	Bill BF	Tarsus Tar2 right	Tarsus Tar2 left	Bill width Bwd	Bill width Bwf	Hind toe vToeh	Hind toe claw vClh	Central toe vToec	Central toe claw vClc	Length P1	P1/PC	P2/WT	P3/WT	P4/WT	P5/WT	P6/WT	P7/WT	P8/WT	P9/WT	P10/WT	Kipp index	Emargination inner web P2	Emargination inner web P3	Notch outer web P3	Notch outer web P4	Tail feather R1/R6	Bristles	Shape of bill
Acrocephalus	scirpaceus	2	ZMB	2002/95	ju	m	Tokhoshi, Awdal, Somalia	16 Oct 2002	GN	GN	57.1	55.0	49.3	16.0	11.2	21.0	20.9	3.0	5.3	8.8	7.7	10.2	5.0	7.4	-4.1	[m]	0.0	0.0	-3.0	-4.0	-5.3	-7.1	-8.4	10.0	[m]	[m]	11.5*	7.7	5.3	1.1		
		2	ZFMK	76.818	br	m	Suakin, NE Sudan	11 Mar 1976	GN	GN	57.0	59.2	58.0	15.4	11.3	19.8	18.8	3.2	6.1	8.2	6.9	10.2	4.9	8.3	-3.0	-4.7	0.0	0.0	-1.4	-2.8	-5.0	-6.2	-7.0	-9.2	11.0	13.7	10.8	17.0	11.0*	5.3	5.7	1.4
	avicenniæ	2	ZFMK	76.819	br	m	Suakin, NE Sudan	10 Mar 1976	GN	GN	56.2	56.0	49.2	15.4	9.6	20.0	19.7	3.3	5.9	8.4	6.7	9.0	5.2	7.2	-3.1	-3.0	0.0	-0.5	-1.0	-3.2	-4.8	-5.2	-7.5	-9.0	10.5	13.4	10.7	13.0	9.3*	5.1	5.4	1.5
		2	ZFMK	76.820	br	m	Suakin, NE Sudan	10 Mar 1976	GN	GN	58.6	58.0	50.0	15.3	10.6	19.4	19.0	3.4	6.3	8.3	6.0	10.0	5.0	6.7	-2.9	-4.2	0.0	-0.3	-1.9	-3.7	-6.0	-7.3	-8.0	-10.0	10.4	13.1	10.7	13.5	9.6*	6.5	6.7	1.3
ammon	1	h	SNSD	2014/64	ad	?	Siwa, Egypt	12 May 2014	JH, EF, WH	JH	56.3	56.1	48.2	14.9	12.0	20.8	20.9	3.8	4.7	7.8	6.5	7.2	5.0	7.4	-1.2	-0.8	0.0	-0.5	-2.2	-3.4	-5.0	-5.8	-8.0	-8.8	11.0	14.0	16.5*	16.8	0.0	6.8	6.8	0.2
	1	p	SNSD	2014/69	ad	?	Siwa, Egypt	12 May 2014	JH, EF, WH	JH	52.3	52.9	47.8	14.2	10.3	20.0	19.4	2.4	4.4	7.7	7.6	9.8	6.0	6.0	-3.0	-3.8	-1.0	0.0	-1.1	-2.3	-3.9	-4.8	-6.7	-8.0	10.7	11.8	9.2*	15.4	0.0	8.3	4.9	1.7

Author: 1 = auct.; 2 = Ash *et al.* 1989; 3 = (Ehrenberg, 1833); 4 = (Hermann, 1804); 5 = Reichenow, 1908; 6 = (Beckstein, 1798). **Status:** h = holotype; p = paratype; s = syntype; dw = detached wing. **Age:** ad = adult; br = adult [breeding]; ju = juvenile; ? = not given. **Sex:** f = female; m = male; ? = not given. **Collected by / Measured by:** AM = A. F. v. Mecklenburg; B = Berg; BA = B. Alexander; BM = BMNH staff; BS = B. Sergeev; CE = C.G. Ehrenberg; DH = D. Heidecke; F = F. Fuchs; ES = E. Stresmann; FH = F.W. Hemprich; GN = G. Nikolaus; HB = H. v. Bötticher; HL = H. Lynes; HS = H. Schubatz; JH = J. Hering; RP = R. Piechocki; WH = W. Heim; Z = Zsch. [Mt. Zschorn]; ZN = ZNS staff; ? = not given. **Measurements:** [b] = broken; [l] = [lacking]; [m] = [moult]; [mt] = not taken; [w] = [worn].

Genus	Specific epithet	Author	Status	Inventory number	Age	Sex	Locality	Date	Collected by	Measured by	Wmax right	Wmax left	Tail T1	Bill BSK	Bill BF	Tarsus Tar2 right	Tarsus Tar2 left	Bill width BWD	Bill width BWf	Hind toe Vtoeh	Hind toe claw Vclh	Central toe Vtoec	Central toe claw vclc	Length P1	P1/PC	P2/MT	P3/MT	P4/MT	P5/MT	P6/MT	P7/MT	P8/MT	P9/MT	P10/MT	Kipp index	Emargination inner web P2	Emargination inner web P3	Notch outer web P3	Notch outer web P4	Tail feather R1/R6	Bristles	Shape of bill
Acrocephalus scirpaceus avicenniae	2			ZFMK 76.821	br	f	Suakin, NE Sudan	10 Mar 1976	GN	GN	58.8	56.3	52.1	15.0	10.1	19.3	19.8	2.9	5.2	8.5	6.1	10.1	5.2	7.8	-3.3	-3.7	0.0	-0.8	-2.6	-3.5	-4.9	-5.3	-8.0	-9.1	10.5	13.3	10.0	15.0	9.7*	3.4	6.0	2.4
	2			ZFMK 76.822	br	f	Suakin, NE Sudan	11 Mar 1976	GN	GN	58.4	58.8	48.0	15.2	9.3	19.6	19.9	3.0	5.7	7.8	6.8	9.9	5.1	7.3	-2.0	-3.9	0.0	-0.5	-2.3	-3.8	-5.7	-7.5	-8.2	-10.8	11.9	13.3	11.5	16.5	11.0*	5.5	5.0	1.3
	2			ZFMK 76.823	br	f	Suakin, NE Sudan	11 Mar 1976	GN	GN	59.2	58.2	51.3	16.1	10.3	18.1	19.4	3.9	5.3	9.1	6.8	9.3	5.2	10.0	-2.1	-3.8	0.0	-0.1	-1.8	-3.7	-4.9	-6.7	-8.2	-10.0	11.3	13.5	10.7	14.1	10.1*	4.2	4.8	1.2
	2			ZFMK 76.824	br	f	Suakin, NE Sudan	11 Mar 1976	GN	GN	57.0	57.5	55.6	15.0	9.6	19.3	18.6	3.3	5.2	8.0	6.8	9.4	5.0	7.7	-1.8	-5.0	-0.1	0.0	-2.3	-3.1	-3.9	-5.0	-7.6	-8.1	11.3	13.3	10.0	15.8	10.0*	5.8	5.0	0.8
	2			ZFMK 76.825	?	f	Suakin, NE Sudan	11 Mar 1976	GN	GN	55.9	56.0	47.0	14.4	10.1	19.1	18.9	3.9	5.8	7.7	6.1	9.2	5.7	7.8	-2.0	-3.6	0.0	-0.4	-1.8	-2.4	-3.2	-6.1	-6.9	-8.2	10.0	12.7	8.4	16.3	9.2*	6.2	5.5	1.7
Acrocephalus scirpaceus avicenniae	2			SMNS 59305	ad	m	30km N Suakin, NE Sudan	3 Aug 1981	GN	DP	57.0	57.0	52.5	15.8	9.1	19.2	20.5	3.0	5.1	9.2	7.2	10.6	5.4	9.1	0.0	-3.7	0.0	-1.1	-2.7	-4.2	-5.3	-6.4	-7.6	-8.0	9.4	12.8	[mt]	13.0*	[mt]	7.0	6.3	1.1
	2			SMNS 59306	ad	f	30km N Suakin, NE Sudan	3 Aug 1981	GN	DP	55.0	55.4	50.2	16.2	11.6	21.0	20.3	3.3	6.2	8.8	7.1	10.7	5.4	[w]	-3.3	0.0	-1.1	-2.2	-4.0	-5.1	-6.7	-8.0	-9.2	9.8	12.7	[mt]	15.0*	[mt]	[w]	6.2	1.2	
2				SMNS 59909	ad	m	30km N Suakin, NE Sudan	18 Mar 1983	GN	DP	56.0	55.4	51.1	15.2	9.9	21.3	21.4	3.2	6.5	8.3	6.0	11.5	5.2	6.5	-2.8	-4.2	0.0	-0.2	-1.7	-2.3	-4.8	-6.6	-7.3	-9.9	11.1	12.7	[mt]	14.5*	[mt]	6.0	5.8	0.9
2				SMNS 59910	ad	f	30km N Suakin, NE Sudan	18 Mar 1983	GN	DP	56.2	56.2	50.9	14.8	9.5	20.3	19.9	2.9	5.9	8.4	6.3	10.4	5.1	6.4	-3.8	-4.7	0.0	-0.5	-3.0	-4.9	-6.0	-8.3	-9.2	-9.7	11.2	13.2	[mt]	16.2*	[mt]	5.5	5.9	1.0
2				SMNS 59911	ad	m	30km N Suakin, NE Sudan	18 Mar 1983	GN	DP	56.0	55.0	54.9	16.2	10.3	20.5	20.6	3.0	6.3	8.2	6.7	10.2	5.9	7.7	-2.6	-5.0	0.0	-0.4	-1.2	-4.2	-6.7	-7.8	-9.2	-10.5	10.8	12.8	[mt]	16.8*	[mt]	7.1	5.9	1.3

TABLE 1 cont.

Author: 1 = auct.; 2 = Ash *et al.* 1989; 3 = (Ehrenberg, 1833); 4 = (Hermann, 1804); 5 = Reichenow, 1908; 6 = (Beckstein, 1798). **Status:** h = holotype; p = paratype; s = syntype; dw = detached wing. **Age:** ad = adult; br = adult (breeding); ju = juvenile; ? = not given. **Collected by / Measured by:** AM = A. F. v. Mecklenburg; B = Berg; BA = B. Alexander; BMI = BMNH staff; BS = B. Sergeevic; CE = C.G. Ehrenberg; DH = D. Heidecke; DP = D. Pearson; EF = E. Fuchs; ES = E. Stressemann; FH = F.W. Hemprich; GM = G. Nikolaus; HB = H. v. Bötticher; HL = H. Lynes; HS = H. Schubatz; JH = J. Hering; RP = R. Piechocki; WH = W. Heim; Z = Zsch. (Mr Zschorn); ZN = ZNS staff; ? = not given. **Measurements** [b] = broken; [l] = [lacking]; [m] = [moult]; [mt] = not taken; [w] = [worm].

Genus	Specific epithet	Subspecific epithet	Inventory number	Age	Sex	Locality	Date	Collected by	Measured by	Wmax right	Wmax left	Tail T1	Bill BSk	Bill BF	Tarsus Tar2 right	Tarsus Tar2 left	Bill width BwD	Bill width BwF	Hind toe vToeh	Hind toe claw vClh	Central toe vToec	Central toe claw vClc	Length P1	P1/PC	P2/MT	P3/MT	P4/MT	P5/MT	P6/MT	P7/MT	P8/MT	P9/MT	P10/MT	Kipp index	Emargination inner web P2	Emargination inner web P3	Notch outer web P3	Notch outer web P4	Tail feather R1/R6	Bristles	Shape of bill
fuscus	3 s	ZMB 260	?	?	?	N Arabia	not given	FH, CE	66.0	64.8	49.8	16.7	14.0	22.7	23.2	3.4	6.0	10.1	7.0	11.6	5.8	11.0	1.7	-1.7	0.0	-1.2	-3.5	-6.0	-7.1	[m]	-8.9	[m]	14.7	10.7	0.0	11.3*	0.0	6.1	4.8	0.8	
	3 s	ZMB 3958	?	?	?	[Nubia]	not given	FH, ES	65.9	65.4	53.8	15.9	11.5	21.3	22.7	3.0	5.6	10.2	7.0	11.0	4.9	11.1	0.0	-1.7	0.0	-1.3	-5.1	-7.3	[m]	-10.2	-11.4	-13.7	17.2	12.9	0.0	12.8*	0.0	7.4	[w]	1.3	
	3	ZMB 2000/40590	ju	?	?	Yeloten, Murgap R, Turkmenistan	24 Jul 1939	BS	ES	63.3	63.9	51.3	15.8	11.4	23.2	22.6	3.3	5.9	10.1	7.2	11.4	6.7	10.0	-0.1	-2.8	0.0	-2.1	-4.9	-7.6	[b]	-11.8	[m]	-13.7	16.8	11.0	0.0	14.4*	0.0	8.2	5.1	0.4
Acrocephalus scirpaceus	4	IZH-V 7749	?	?	?	Halae [Halae/Saale, Germany]	1816 [acqu.]	Z	HB	64.0	64.3	55.6	15.2	11.1	23.3	[b]	3.3	5.5	9.4	7.1	11.7	5.2	8.2	-3.0	-1.7	0.0	-1.8	-4.6	-8.0	-9.7	-10.8	-11.5	-13.1	16.2	11.7	6.8*	14.2	0.0	5.8	5.1	1.3
	4	IZH-V 7751	?	?	?	Halae [Halae/Saale, Germany]	not given	?	HB	65.0	64.2	53.2	14.9	9.6	22.6	21.9	3.2	5.3	9.0	7.0	11.4	5.2	8.9	-1.3	-1.2	0.0	-2.7	-5.2	-8.1	-10.7	-12.4	-14.7	-16.8	18.7	13.0	7.5*	11.0	0.0	7.7	5.0	1.0
	4	IZH-V 7735	?	?	?	Halae [Halae/Saale, Germany]	[< 1830]	Z	HB	62.4	62.8	50.5	14.5	10.7	22.8	21.5	3.2	6.1	9.1	7.2	12.0	6.6	9.4	-1.0	-2.5	0.0	-2.8	-6.6	-8.3	-9.5	-10.4	-12.0	-14.0	16.2	10.7	6.3*	14.4	0.0	5.5	5.1	0.8
scirpaceus	4	IZH-V 4303	ad	f	f	Faule Ort, Müritz, Germany	20 May 1969	?	ZN	64.0	65.0	54.4	15.6	11.7	20.8	21.6	3.2	5.3	9.6	7.3	11.1	6.3	9.7	-1.7	-1.2	0.0	-1.7	-3.8	-6.4	-8.7	-10.7	-13.1	-13.7	16.4	12.9	7.5*	14.0	0.0	5.3	5.0	1.2
	4	IZH-V 4297	ad	m	m	Faule Ort, Müritz, Germany	20 May 1968	?	ZN	67.9	68.1	54.5	16.3	10.8	22.5	22.7	3.3	5.2	9.2	7.3	11.4	6.2	10.5	0.8	-1.7	0.0	-2.6	-6.3	-8.7	-10.2	-14.2	-14.6	-15.3	18.3	13.2	7.6*	17.2	0.0	4.8	6.4	1.7
	4	IZH-V 4294	ad	m	m	Faule Ort, Müritz, Germany	29 May 1966	B	B	64.8	65.7	54.6	15.1	10.8	22.2	22.2	3.2	5.4	8.4	7.6	11.3	7.0	8.7	-3.4	-2.7	0.0	-2.7	-5.0	-8.1	-10.2	-12.1	-14.3	-16.7	18.0	12.7	7.7*	13.5	0.0	2.4	6.0	1.2
	4	IZH-V 4874	ju	f	f	Faule Ort, Müritz, Germany	7 Aug 1960	RP	RP	65.4	64.8	52.8	14.8	9.6	23.5	22.7	3.2	5.3	9.7	7.9	12.6	7.2	10.5	[m]	-1.3	0.0	-2.4	-5.4	-8.3	-10.8	-12.8	-14.0	-16.6	17.8	11.3	8.3*	13.1	0.0	3.2	5.0	0.7

Author: 1 = auct.; 2 = Ash *et al.* 1999; 3 = (Ehrenberg, 1833); 4 = (Hermann, 1804); 5 = Reichenow, 1908; 6 = (Bechstein, 1798). **Status:** h = holotype; p = paratype; s = syntype; dw = detached wing. **Age:** ad = adult; br = adult [breeding]; ju = juvenile; ? = not given. **Sex:** f = female; m = male; ? = not given. **Collected by / Measured by:** AM = A. F. v. Mecklenburg; B = Berg; BA = B. Alexander; BM = BMNH staff; BS = B. Sergeevic; CE = C.G. Ehrenberg; DH = D. Heidecke; FH = F. Fuchs; ES = E. Stresmann; FH = F.W. Hemprich; GW = G. Nikolaus; HB = H. v. Bötticher; HL = H. Lynes; HS = H. Schubatz; JH = J. Hering; RP = R. Piechocki; WH = W. Heim; Z = Zsch. [Mr. Zschorn]; ZN = ZNS staff; ? = not given. **Measurements:** [a] = broken; [l] = 'lacking'; [m] = [molt]; [mt] = [not taken]; [w] = [worm].

[illegible]

TABLE 2

Records of the new taxon in desert depressions in the Egypt / Libya border region (captures, nests, and selected sight and song records).

Site	Coordinates	Metres below sea level	Type of record
Siwa Oasis, Ain Safi spring	29°08'03.71"N, 25°47'57.33"E	8	Capture
Siwa Oasis, Lake Zaytun	29°13'12.28"N, 25°33'32.48"E	20	Sight record
Siwa Oasis, Lake Siwa	29°13'17.74"N, 25°25'44.06"E	18	Capture, nests
Siwa Oasis, Lake Maraqi	29°15'29.24"N, 25°18'55.30"E	16	Capture, nests
Siwa Oasis, sewage ponds	29°14'46.52"N, 25°31'06.81"E	6	Capture, nests
Siwa Oasis, Cleopatra's Spring gardens	29°11'49.43"N, 25°33'02.09"E	9	Capture, nests
Siwa Oasis, gardens near Shali	29°12'10.13"N, 25°31'31.87"E	10	Capture, nests
Qara oasis	29°35'49.78"N, 26°30'51.69"E	56	Capture
Sitra oasis, Haisha spring marsh	28°46'30.35"N, 27° 5'36.67"E	18	Sight record
Al Jaghbub oasis, Freja salt lake	29°36'02.81"N, 24°29'37.22"E	11	Nest, sight record
Al Jaghbub oasis, Abuzed salt lake	29°35'14.05"N, 24°42'05.37"E	5	Nest
Al Jaghbub oasis, Malfa salt lake	29°44'57.57"N, 24°46'51.44"E	5	Sight record

p2 and p3 (numbered ascendently) and emargination / notches on outer web of p3 (partly lacking in other taxa—see below), rather short toes (central toe <10 mm long) and slender bill (width at base <5 mm, length nearly identical to other taxa).

Bare-part colours.—Iris (in live bird) dark olive in juveniles and pale olive in adults. Gape reddish orange, tongue red with yellow tip; nestlings and juveniles have two dark spots on tongue.

Geographic distribution.—Large Libyan Desert depressions on the Libya / Egypt border (Qattara, Siwa, Sitra and Al Jaghbub).

Specimens studied.—For museum acronyms, see Table 1. *A. s. ammon* ($n = 2$): SNSD 2014/64, 2014/69. *A. s. fuscus* ($n = 3$): ZMB 260, 3958 (syntypes of *Curruca fusca* Hemprich & Ehrenberg, 1833), 2000/40590. *A. s. avicenniae* ($n = 15$): ZMB 2002/95, ZFMK 76.818–76.825, SMNS 59305–59306, 59909–59911, NHMUK 1952.25.23 (holotype of *Acrocephalus baeticatus avicenniae* Ash et al., 1989, photographs). *A. s. scirpaceus* ($n = 31$): ZMB 43/1503, 54/81, 1995/42, 76/65, IZH-V 3510, 3528a–b, 4292–4303, 4865–4867, 4869–4874, 4877–4879. *A. b. cinnamomens* ($n = 5$): ZMB 48/9 (holotype of *Acrocephalus cinnamomens* Reichenow, 1908), NHMUK 1922.12.8.1015–1017, 1911.12.23.2289. *A. r. rufescens* ($n = 2$): ZMB 30843, 59/1. *A. g. gracilirostris* ($n = 2$): ZMB 31158, 31159. *A. g. jacksoni* ($n = 2$): ZMB 2000/40602–603. *A. s. stentoreus* ($n = 2$): ZMB 3942 (syntype of *Curruca stentorea* Hemprich & Ehrenberg, 1833), 2000/40631. *A. palustris* ($n = 9$): ZMB 2000/40573, 2000/40575, 54/82, 44/243, IZH-V 3526–3527, 4288–4290.

Etymology.—The epithet *ammon*, a noun in apposition (cf. Art. 11, 31.2.1., 31.2.3., ICZN 1999) derives from the ancient Egyptian sun god *Ammon-Re* (or *Amnn-Re*) who was deified by the local people of the Siwa Oasis and its environs. Siwa was known by the names *Ammonion* and *Ammonium* during ancient times as the site of an oracle consulted by Bedouins. The ruins of the sun temple are centred in the gardens of Siwa Oasis (Fig. 2), the distribution hotspot of Siwa Reed Warbler. The English vernacular name refers to this locality.

Comparisons with other *Acrocephalus* in the region

A. scirpaceus avicenniae Ash et al. 1989 (Figs. 3, 8–9), breeding in coastal mangroves in Egypt and nearby Sudan and Somalia (Ash et al. 1989, Dyrce 2006, Hering et al. 2012, 2013),

has grey-olive upperparts and whitish underparts with a yellow tinge towards vent, flanks equally pale, emargination on inner web of p2 and, sometimes albeit poorly developed, on p3, and emarginations on outer web of p3 and, hardly visible or even lacking, on p4. In comparison, *ammon* has a prominent cinnamon tinge to lower upperparts and more intense coloration (not whitish, but yellow ochre to pale pinkish buff) on flanks and lower belly. Emarginations on inner webs of primaries and emarginations on outer webs similar, especially compared to a series collected 30 km north of Suakin, north-east Sudan, with rather pointed wings. A first-year *avicenniae* from Somalia (ZMB 2002/95) is quite close in coloration to adult *ammon*, but the dorsal tone is olive-brown/grey in the former, not cinnamon. The overall size and eco-morphological measurements (wing shape and foot morphology) are similar in these taxa and reflect similarities in their ecological niches, such as non-migratory and tree-dwelling behaviour (cf. Table 1).

A. s. fuscus (Hemprich & Ehrenberg, 1833) (Figs. 4–5), known to migrate through Egypt at least (Goodman & Meininger 1989), differs in the following characters: strongly olive upperparts (fresh juveniles have rufous-tinged rump; in *ammon* cinnamon), more whitish underparts (rather buff in *ammon*), flanks only slightly washed clay colour, and thighs off-white (strongly clay with rusty hue in *ammon*). Fringes of primaries and secondaries less tawny olive and rather inconspicuous. In specimens, bill, legs and claws horn, thus much paler than *ammon*. Overall size visibly larger, especially wings, tarsi less so; slight emargination on outer web of p3, no notch / emargination on outer web of p4 in those specimens studied, but for populations in Arabia, Israel and presumably those in Nile Delta emarginations are occasionally recorded on p4 (D. J. Pearson *in litt.* 2015), no emargination on inner web of p3; primary projection indicates a migrant (cf. Table 1). Toes in *fuscus* considerably longer than *ammon* (central and hind toe >10 mm).

A. s. scirpaceus (Hermann, 1804) (Figs. 6–7), a common migrant in the region (Schulze-Hagen 1991, Pearson 1997, Dyrce 2006), is a rather uniformly coloured taxon with hair-brown (cf. Smithe 1975) upperparts (lacking cinnamon tinge of *ammon*), primaries, secondaries and wing-coverts lacking clay and tawny-olive fringes of *ammon*, underparts very similar or nearly indistinguishable from *ammon*, but on average with less prominent yellowish-ochre/pale pinkish-buff flanks. Larger than *ammon* with considerable differences in wing length and proportions (migratory vs. sedentary), with a rather slight but proximal emargination on inner web of p3 and considerably longer toes, with central toe >11 mm (in *ammon*, but statistically weak with two specimens <10 mm), indicating better adaption to reedbed environment than in *ammon*, which is a more tree-dwelling bird.

A. baeticatus cinnamomeus Reichenow, 1908 (Figs. 8–9), also resident in region, breeding in Chad, western Sudan, South Sudan (Pearson 1997, Dyrce 2006) and nearby Libya (Hering *et al.* 2010a); similar to both *avicenniae* and *ammon*. Field data indicate that due to colour variation within *A. b. cinnamomeus*, differentiation between it and *ammon* is difficult (Hering *et al.* 2009, 2010a). The holotype of *cinnamomeus* (ZMB 48/9) is dorsally and ventrally unambiguously cinnamon (adult *ammon* is only cinnamon on upperparts while the underparts vary between pale buff, yellowish ochre and clay), but due to its being 'juvenile' this is not diagnostic. Adult *cinnamomeus* is similar to *ammon* on belly and flanks, but less whitish on throat and upper breast (also rather buff). Upperparts, especially forehead, crown, mantle and upper back, visibly less cinnamon than *ammon*, more olive-brown; cinnamon tinge only on vent and uppertail-coverts. However, these differences are probably due to UV bleaching and moult cycle, respectively, rather than a diagnostic character. Bill more amber to yellowish ochre in *cinnamomeus*, rather than pale grey as in *ammon* according to both label / field data and specimens. Overall size is similar in *ammon* with a slightly broader bill and shorter tail. Divergence in eco-morphological characters is

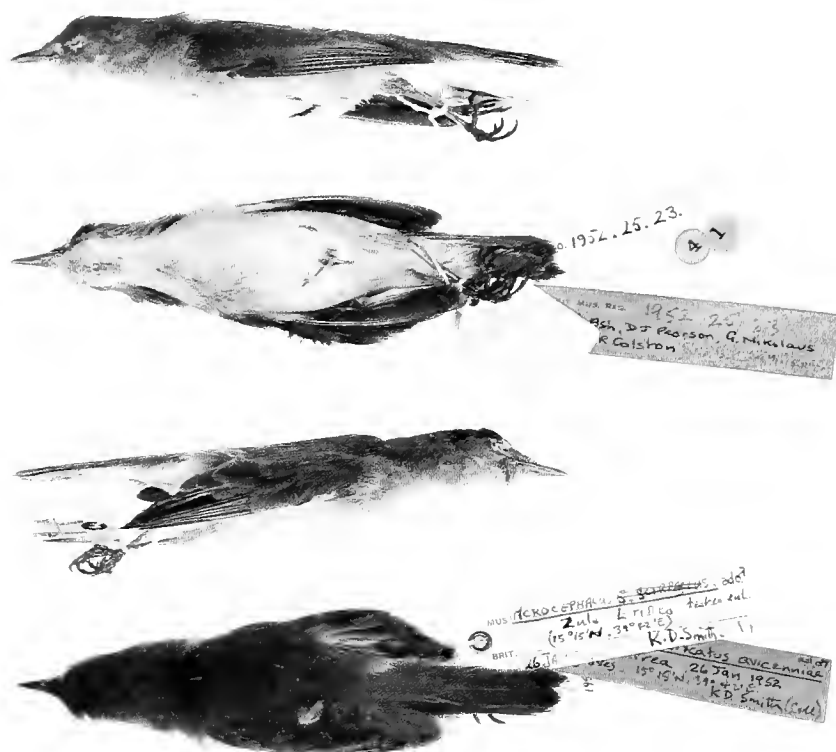


Figure 3 (left). Holotype of *Acrocephalus scirpaceus avicenniae* NHMUK 1952.25.23, lateral, ventral, lateral, dorsal views (© Harry Taylor, Natural History Museum, London)

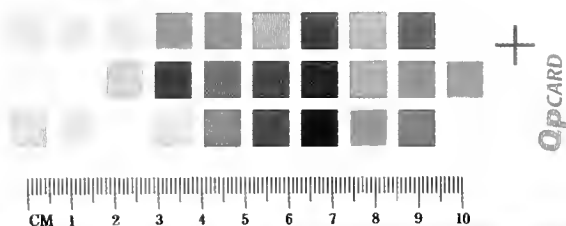


Figure 4 (below). Left to right: dorsal view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. s. fuscus* syntypes ZMB 260 and 3958, ZMB 2000/40590 (Frank D. Steinheimer)



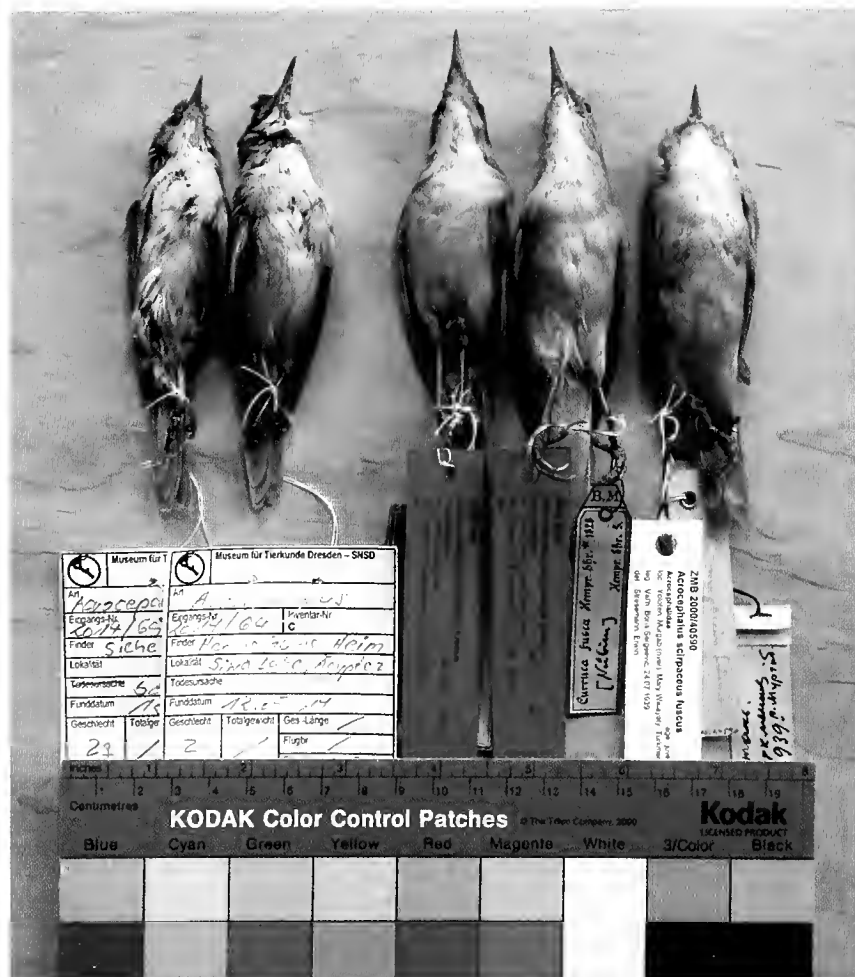


Figure 5 (left). Left to right: ventral view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. s. fuscus* syntypes ZMB 260 and 3958, ZMB 2000/40590 (Frank D. Steinheimer)

Figure 6 (below). Left to right: dorsal view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. s. scirpaceus* ZMB 43/1503, 54/81, 1995/42, 76/65 (Frank D. Steinheimer)





Figure 7. Left to right: ventral view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. s. scirpaceus* ZMB 43/1503, 54/81, 1995/42, 76/65 (Frank D. Steinheimer)



Figure 8. Left to right. dorsal view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. baticatus cinnamomeus* holotype ZMB 48/9; *A. s. avicenniae* SMNS 59305, 59306, 59909-911 (*contra* label, identified by D. J. Pearson) (Frank D. Steinheimer)



Figure 9. Left to right: ventral view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. baeticatus cinnamomeus* holotype ZMB 48/9; *A. s. avicenniae* SMNS 59305, 59306, 59909–911 (contra label, identified by D. J. Pearson) (Frank D. Steinheimer)



Figure 10. Left to right: dorsal view of *Acrocephalus scirpaceus ammon* paratype SMSD 2014/69, holotype SMSD 2014/64; *A. palustris* ZMB 2000/40573, 2000/40575, 54/82, 44/243 (Frank D. Steinheimer)

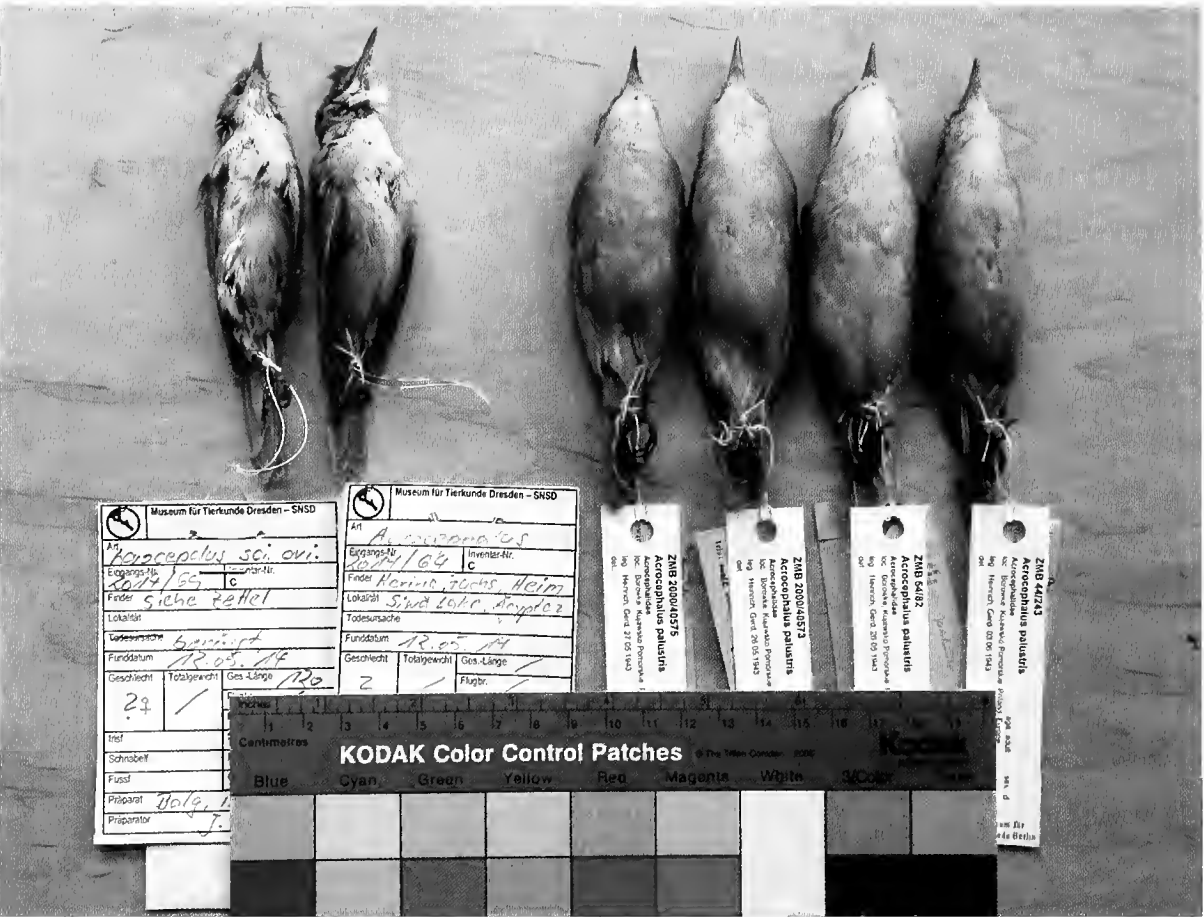
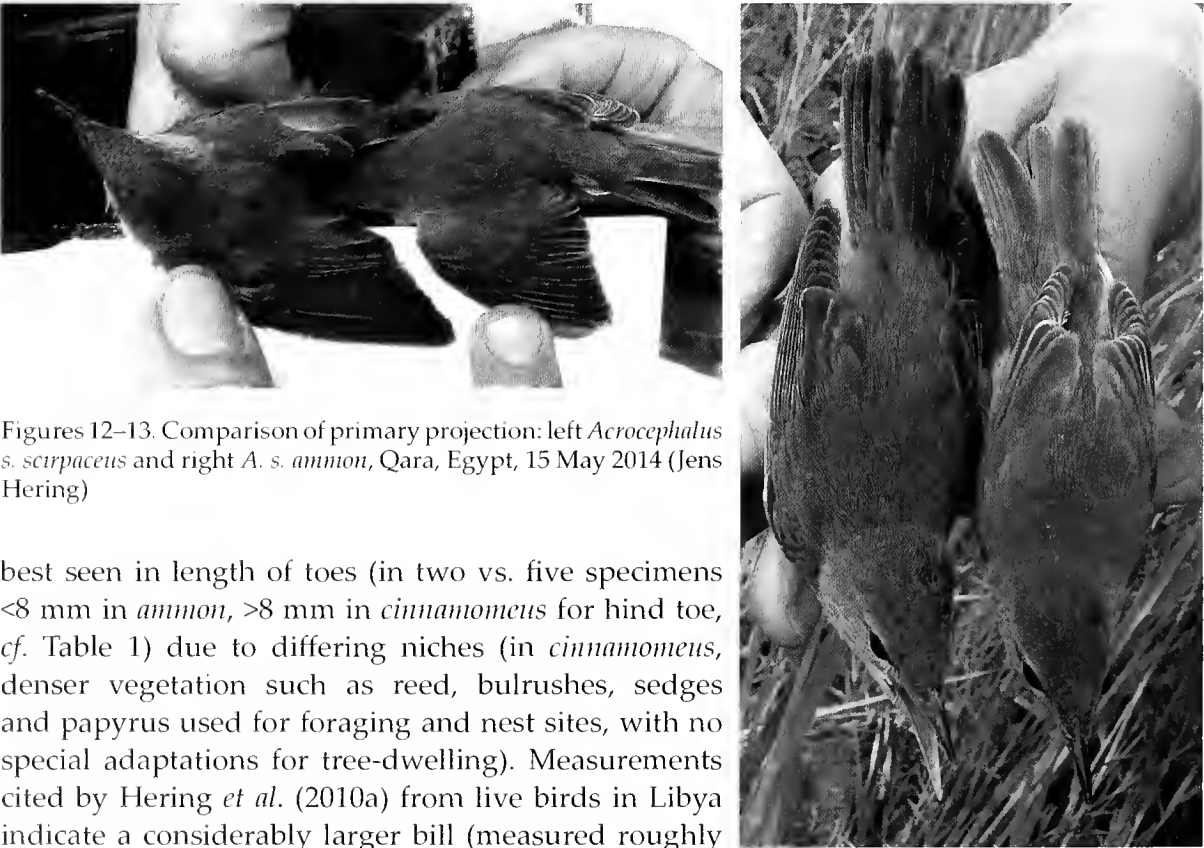


Figure 11. Left to right: ventral view of *Acrocephalus scirpaceus* ammon paratype SMSD 2014/69, holotype SMSD 2014/64; *A. palustris* ZMB 2000/40573, 2000/40575, 54/82, 44/243 (Frank D. Steinheimer)



Figures 12–13. Comparison of primary projection: left *Acrocephalus s. scirpaceus* and right *A. s. ammon*, Qara, Egypt, 15 May 2014 (Jens Hering)

best seen in length of toes (in two vs. five specimens <8 mm in *ammon*, >8 mm in *cinnamomeus* for hind toe, cf. Table 1) due to differing niches (in *cinnamomeus*, denser vegetation such as reed, bulrushes, sedges and papyrus used for foraging and nest sites, with no special adaptations for tree-dwelling). Measurements cited by Hering *et al.* (2010a) from live birds in Libya indicate a considerably larger bill (measured roughly

from tip to feather bases 10.3–12.0 mm in *ammon* / 15.5–16.0 mm in *baeticatus*) and stronger tarsus (19.4–20.9 mm in *ammon* / 24.5–27.0 mm in *baeticatus*) though measurements of live birds can differ considerably from specimens (cf. Deutsche Ornithologen-Gesellschaft 2011) so these data cannot be compared with Table 1. Overall, *cinnamomeus* is morphologically closest to the new taxon.

A. palustris (Bechstein, 1798) (Figs. 10–11), which occurs in the region on migration (Schulze-Hagen 1991, Pearson 1997, Dyrce 2006), is overall very similar to *A. s. fuscus*, with upperparts uniformly olive-grey without any rufous or cinnamon tinge, margins of wing-coverts and primaries pale buff, not tawny olive or clay as in *ammon*. Underparts warm buff similar to *ammon*, but without any contrast vs. thighs and flanks as in *ammon* (flanks vary between yellow-ochre, clay and pale pinkish buff; thighs rusty clay). The contrast between upperparts and underparts is much less prominent in this plain-coloured species than in *ammon*. *A. palustris* has considerably longer (on average c.10 mm difference) and more pointed wings compared to *ammon* (cf. tip of primaries in relation to wingtip, Kipp index and emarginations / notches of primaries in Table 1); the toes are c.2–3 mm longer, indicating a more distinct usage of vertical structures compared to *ammon*.

Other plain-coloured species.—Great Reed Warbler *A. arundinaceus*, with some moving through north-east Africa on migration, Greater Acrocephalus *rufescens* and Lesser Swamp Warblers *A. gracilirostris*, both breeding in Chad and South Sudan, and *A. stentoreus*, which breeds *inter alia* in Egypt are all considerably larger (Pearson 1997, Dyrce 2006).

Live measurements.—For biometric analysis, 43 individuals trapped in Siwa had wing length (flattened and straightened), and some also had tail, bill, tarsus, length of p3 (numbered ascendently), and mass measured. A conspicuous character of reed warblers from Siwa is their short wings (Figs. 12–14). With a mean length of 56.5 mm (s.d. = 1.2 mm, $n = 43$) they are clearly shorter than the wing length—also measured on live birds—of *A. s. scirpaceus* (mean = 65.4 mm, s.d. = 2.0 mm, $n = 39$; JH unpubl., D. J. Pearson *in litt.* 2016), *A. s. fuscus* (mean = 67.1 mm, s.d. = 1.3 mm, $n = 21$; D. J. Pearson *in litt.*), *A. baeticatus* (Libya) (mean = 61.6 mm, s.d. = 2.6 mm, $n = 21$; Hering *et al.* 2009, 2010a, 2011b; JH unpubl.) and *A. s. avicenniae* (mean = 59.0 mm, s.d. = 1.5 mm, $n = 16$; JH unpubl., D. J. Pearson *in litt.* 2016). Pairwise comparisons of wing lengths of Siwa individuals with those of other taxa were statistically significant ($p < 0.05$) in every case (linear models with wing length as dependent variable and the factor subspecies as explanatory variable; *ammon* / *scirpaceus*: $F_{1,80} = 612.4$, $p < 0.001$, adjusted $R^2 = 0.883$; *ammon* / *fuscus*: $F_{1,75} = 1056.0$, $p < 0.001$, adjusted $R^2 = 0.933$; *ammon* / *baeticatus*: $F_{1,62} =$, $p < 0.001$, adjusted $R^2 = 0.642$; *ammon* / *avicenniae*: $F_{1,57} = 44.5$, $p < 0.001$, adjusted $R^2 = 0.428$).

Various authors have regarded the length of the tarsometatarsus (tarsus) as a better parameter of comparative measurement than wing length (Rising & Somers 1989, Freeman & Jackson 1990, Senar & Pascual 1997). However with a mean length of 20.7 mm (s.d. = 0.5 mm, $n = 34$), this character too shows Siwa birds to be the smallest form compared to *A. s. scirpaceus* (mean = 22.4 mm, s.d. = 0.6 mm, $n = 31$) and *A. s. fuscus* (mean = 23.0 mm, s.d. = 0.6 mm, $n = 6$), but not *A. s. avicenniae* (mean = 20.5 mm, s.d. = 0.6 mm, $n = 8$) (Fig. 15). Pairwise comparisons of tarsus lengths of reed warblers from Siwa with those of the other taxa again resulted in statistically significant ($p < 0.05$) differences in most cases (linear models with tarsus length as dependent variable and the factor subspecies as the explanatory variable; *ammon* / *scirpaceus*: $F_{1,63} = 167.1$, $p < 0.001$, adjusted $R^2 = 0.722$; *ammon* / *fuscus*: $F_{1,49} = 116.1$, $p < 0.001$, adjusted $R^2 = 0.697$; *ammon* / *avicenniae*: $F_{1,40} = 1.2$, $p = 0.289$, adjusted $R^2 = 0.004$). In *A. b. cinnamomeus* lengths are similar.

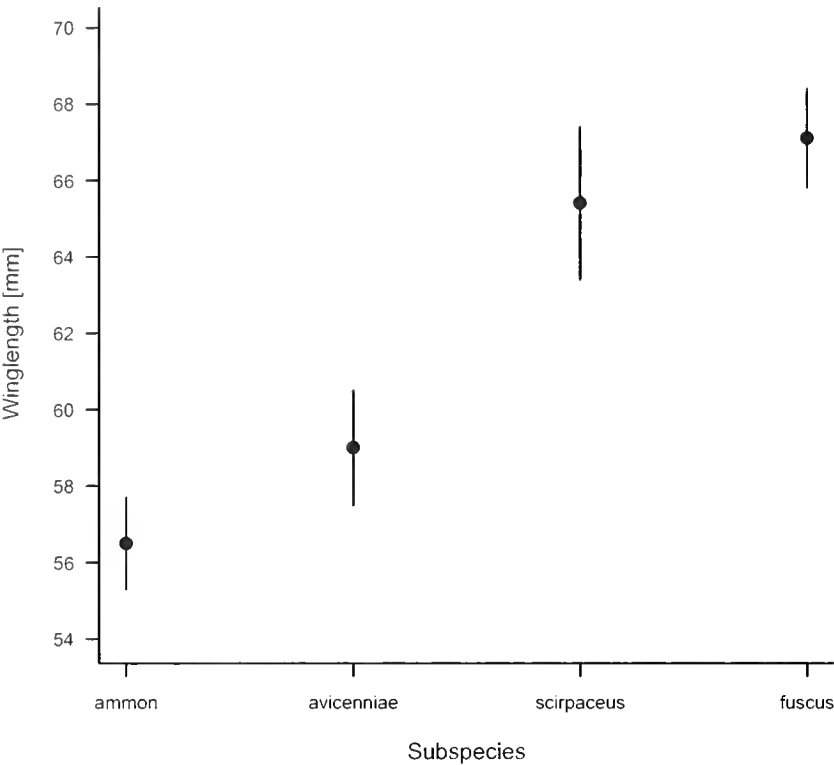


Figure 14. Wing length of Siwa Reed Warbler *Acrocephalus scirpaceus ammon* compared to other reed warbler taxa (*n*: *ammon* 43, *avicenniae* 16, *scirpaceus* 39, *fuscus* 21). X-axis: subspecies; y-axis: wing length (in mm).

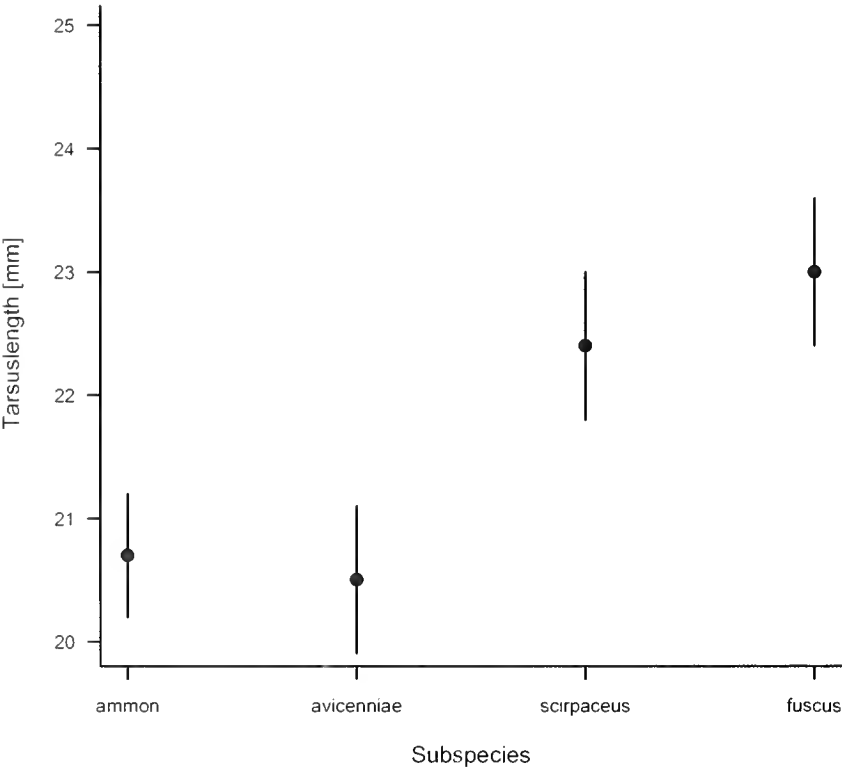


Figure 15. Tarsus length of Siwa Reed Warbler *Acrocephalus scirpaceus ammon* compared to other reed warbler taxa (*n*: *ammon* 37, *avicenniae* 8, *scirpaceus* 31, *fuscus* 6). X-axis: subspecies; y-axis: tarsus length (in mm).

Genetic analysis

On the basis of the 594-base section of the mitochondrial cytochrome-*b* gene sequenced (see Methods for more detail), we identified three haplotypes. The commonest haplotype was represented by six and the second by three individuals. The two haplotypes represent a 0.2% within-population difference. One individual had a mutation that differed from other reed warbler taxa analysed that was most similar to the otherwise commonest haplotype. Uncorrected differences from nominate *scirpaceus* were 1.0–1.3%, from *avicenniae* 1.1–1.5%

and from *fuscus* 0.3–1.2%. We also sequenced the mitochondrial control region II of the same ten birds (cf. Bensch & Hasselquist 1999, Hering *et al.* 2009, 2011a). We obtained a section of 543 bases for seven individuals, one of 530 bases for two individuals, and one of 542 bases for one bird. There were only two haplotypes that differed by one mutation alone, which was found in a single individual. This homogeneity is somewhat surprising (cf. Päckert *et al.* 2007). The mutation did not correspond to any in the 52 reed warbler sequences analysed.

Voice

Song.—The song (Fig. 16) has a structure typical of reed warblers, consisting of a continuous succession of usually repeated single elements. It is very similar to that of other Eurasian Reed Warbler taxa and African Reed Warbler. However the succession of single elements appears to be slower than in nominate *A. scirpaceus* and thus more like that of *avicenniae* (G. Nikolaus in Leisler *et al.* 1997). A comparative sonogram shows that the full song of both *A. s. avicenniae* and the Siwa birds can be distinguished from that of *A. s. scirpaceus* in central Europe (Hering *et al.* 2011a).

Warning call.—The Siwa warblers produced harsh grating sounds (Fig. 17) with a similar structure to those of warning calls described for central European *A. scirpaceus*.

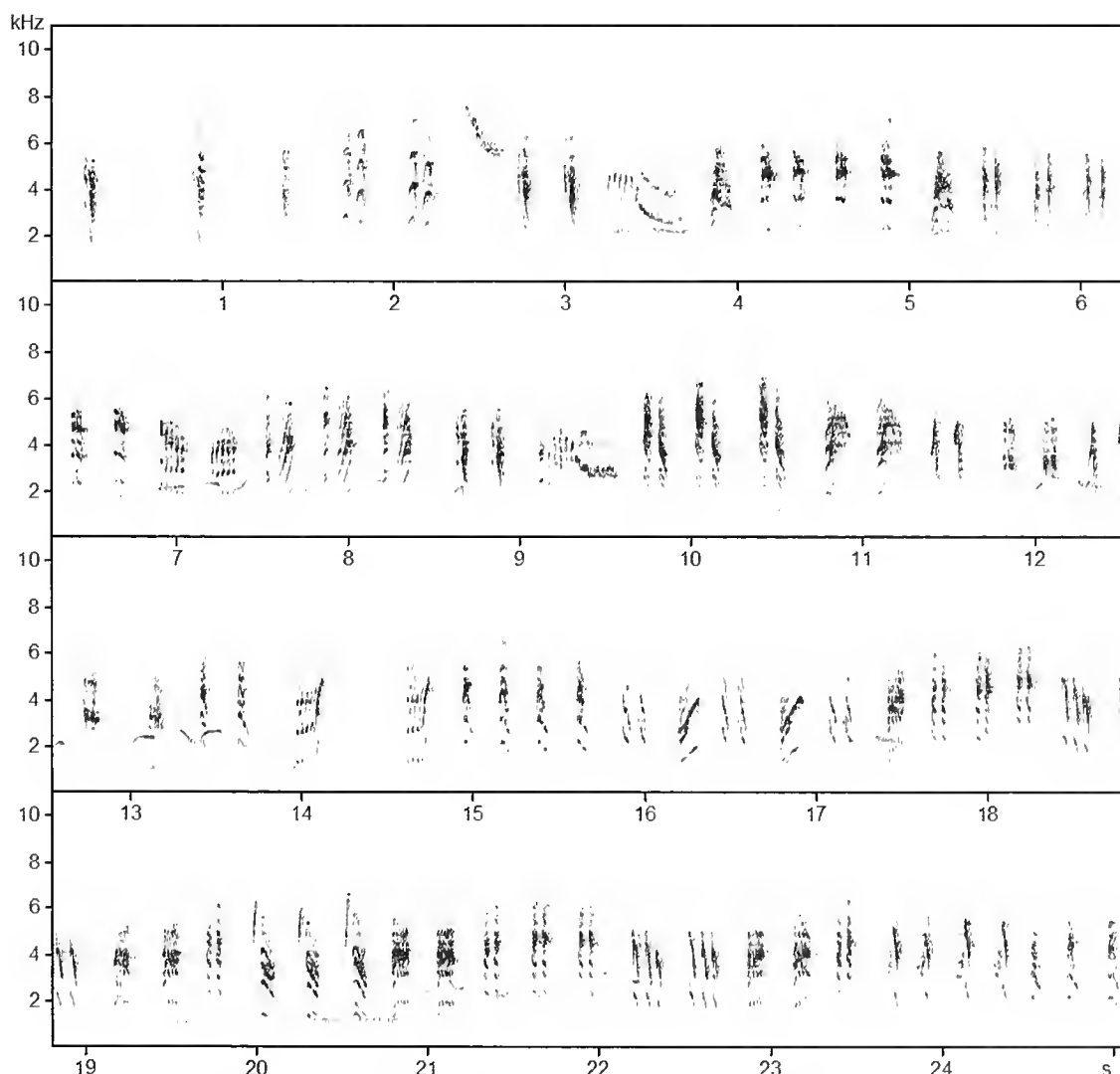


Figure 16. Song of Siwa Reed Warbler *Acrocephalus scirpaceus ammon*, Lake Siwa, Egypt, 12 May 2014 (TSA: *Acrocephalus_scirpaceus_DIG0190_12*). Recording W. Heim, sonogram K.-H. Frommolt.

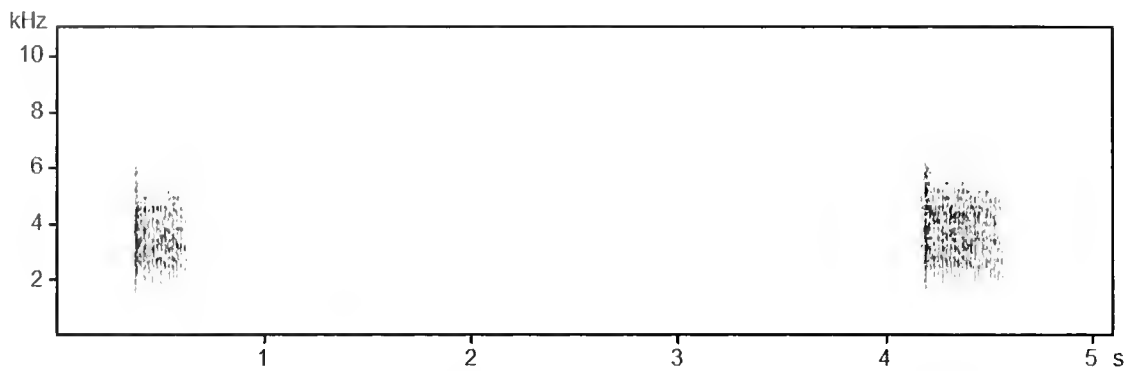


Figure 17. Warning calls of Siwa Reed Warbler *Acrocephalus scirpaceus ammon*, near Siwa Gardens Hotel, Siwa, Egypt, 15 May 2014 (TSA: *Acrocephalus_scirpaceus_DIG0190_22*). Recording W. Heim, sonogram K.-H. Frommolt.

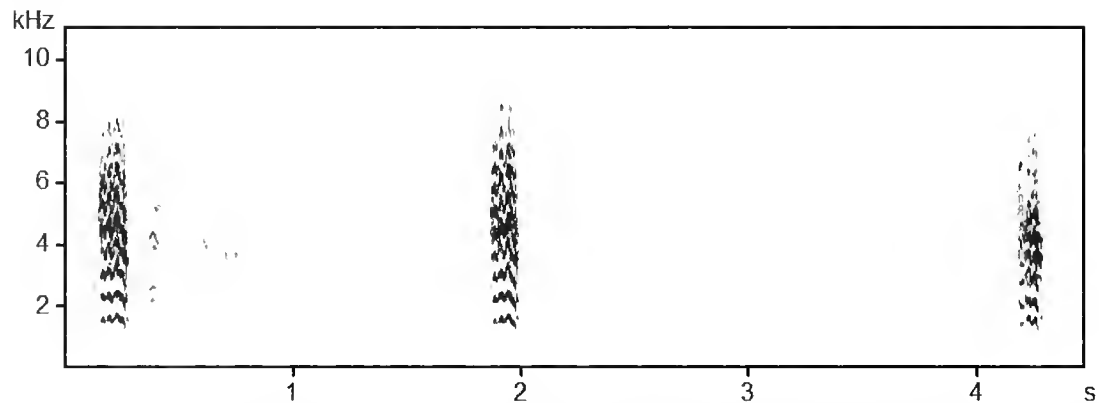


Figure 18. Calls with vibrato of Siwa Reed Warbler *Acrocephalus scirpaceus ammon*, near Lake Siwa, Siwa, Egypt, 15 May 2014 (TSA: *Acrocephalus_scirpaceus_DIG0190_20*). Recording W. Heim, sonogram K.-H. Frommolt.

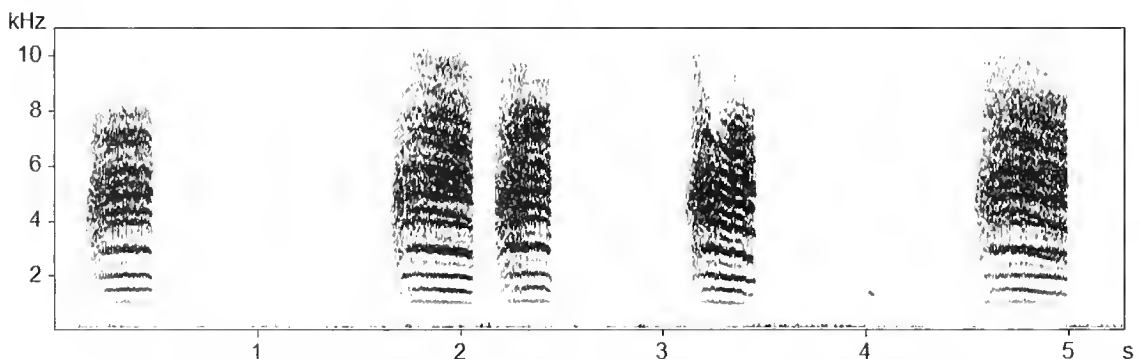


Figure 19. Distress calls while held for ringing by Siwa Reed Warbler *Acrocephalus scirpaceus ammon*, Lake Siwa, Siwa, Egypt, 14 May 2014 (TSA: *Acrocephalus_scirpaceus_DIG0190_23*). Recording W. Heim, sonogram K.-H. Frommolt.

These noisy calls consist of 17–23 elements with a mean duration of 0.37 seconds ($n = 16$; two individuals). The energy of the calls is concentrated over 2–4 kHz.

Calls.—In addition to warning calls, a harmonic-rich call with vibrato was noted (Fig. 18). The energy was concentrated in the range 3–6 kHz, and the calls had a mean duration of 0.12 seconds ($n = 25$; one individual).

Distress call.—Distress calls (Fig. 19) during ringing of one bird were recorded. The calls, uttered in series, had a mean duration of 0.35 seconds ($n = 11$). The time between calls was 0.16–4.41 seconds. The calls contain a strong ‘noise’ element, with energy concentrated at 4–6 kHz.

Habitat

Breeding habitat.—Among the unique traits of the reed warblers in the Siwa Oasis is their preferred breeding habitat (Figs. 2, 20, 22–25), namely date palm and olive tree gardens (c.250,000 date palms and 50,000 olive trees). In the oasis, the birds nest in stands of trees with closed or half-open canopies, with a remarkably high breeding density in the date palm gardens with olive trees in the understorey (see below). The upper stratum of palm trees, up to 12 m tall, creates a degree of cover of c.75–100%; reed warblers are absent in gardens with an open structure and just single trees. In the cultivated area, the stands of reed, frequently in ponds fed by spring water but often small in area, seem to be unimportant for this *Acrocephalus*. Nevertheless, just like other Eurasian Reed Warbler taxa, the Siwa birds also nest in reedbeds, usually in smaller healthy stands of *Phragmites* at the edges, or in the shallow-water zone of salt lakes or spring-fed marshes. Extensive reedbeds grow for instance in Lake Siwa, and in the eastern part of Qara Oasis. Additionally, where waste water enters, e.g. at the northern edge of Siwa Oasis, stands of southern cattail *Typha domingensis* are occupied. In May 2014 a completely dead stand of reed of c.15 ha in a shallow salt lake harboured breeding reed warblers.

Until now, stands of bushes or trees as the main breeding habitat of Eurasian or African Reed Warblers was unknown. Besides *Phragmites* and *Typha*, *A. s. scirpaceus* and *A. s. fuscus* breed very rarely in other vertically structured vegetation, occasionally in planted beds of osier *Salix viminalis* or thickets of dense willow *Salix* shoots (e.g. Schulze-Hagen 1991). G. Nikolaus (pers. comm.) found a nest constructed by the Middle Eastern *fuscus* population in a tamarisk *Tamarix* sp. in Riyadh, Saudi Arabia. However, such habitats were regarded as insignificant (e.g. Schulze-Hagen 1991, Cramp 1992). It is now known that *A. s. avicenniae* breeds exclusively in mangroves, building nests low down, mainly in *Avicenna marina* (Ash *et al.* 1989, Kennerley & Pearson 2010, Porter & Stanton 2011, Hering *et al.* 2012, 2013, 2015). All taxa of African Reed Warbler inhabit wetlands with vegetation consisting predominantly of reed, bulrush (cattail) and sedge, except subspecies *A. b. suahelicus*, which also nests in mangrove. In addition, African Reed Warblers occupy papyrus swamps, floodplains, densely vegetated riverbanks and drainage ditches, fields of sugarcane, irrigation channels and, away from water, wetland copses (Pearson 1997, Dyrce 2006).

Winter habitat.—The first indications of overwintering *A. s. ammon* were noted in December 2009 / January 2010 and December 2010 in the surroundings of Al Jaghub oasis. Short-winged *Acrocephalus* were observed in reeds on the banks of two salt lakes. Winter records were also obtained at Siwa, e.g. in December 2012 in the northern part where waste water is disposed of. In contrast, the reed warblers were not seen in the oasis gardens, where they occur in large numbers during the breeding season. It is possible that food availability plays a decisive role. Our winter observations indicate that the birds probably can be considered sedentary.

Density

The extent of potential breeding habitat in the oasis gardens at Siwa is considerable. The area of highest concentration is certainly the core of the oasis, where the oldest and densest date palm and olive tree gardens are sited. In April 2011, in an area of just 0.75 ha at Shali, six active nests and two additional territories were counted, corresponding to 107 territories / 10 ha, which if extrapolated across suitable habitat in the centre of Siwa Oasis alone would equate to 13,205 territories within 1,238 ha. It would be interesting to compare this with the breeding density of the closely related ‘Mangrove Reed Warbler’, but data are lacking (Ash *et al.* 1989, Kennerley & Pearson 2010). There is also an absence of breeding density data for



20



21



22



23



24



25

Figures 20–21. Left, *Acrocephalus scirpaceus ammon* in the oasis garden; right, *A. s. ammon* on *Phragmites*, Siwa, Egypt, 1 May 2011 and 14 May 2014, respectively (Jens Hering)

Figures 22–23. Nests of Siwa Reed Warbler *Acrocephalus scirpaceus ammon* in old olive trees, Siwa, Egypt, 30 April 2011 and 2 May 2011, respectively (Jens Hering)

Figures 24–25. Nest sites of Siwa Reed Warbler *Acrocephalus scirpaceus ammon* in date palms, Siwa, Egypt, 30 April 2011 and 16 May 2014, respectively (Jens Hering)

other tree-dwelling reed warblers, except Cape Verde Warbler *A. brevipennis*, where a mean breeding density of 0.65 territories / 10 ha in a study area of c.2,000 ha was estimated (Hering & Fuchs 2009). Reed-breeding populations of *A. scirpaceus* reach up to 532 territories / 10 ha, albeit such densities have never been confirmed for large-scale habitats (Schulze-Hagen 1991), where on average there are up to 50–60 territories / 10 ha (Dorsch & Dorsch 1985).

Breeding biology

Nest site.—Unique within the Eurasian / African Reed Warbler superspecies is the frequency with which nests are sited in trees, palms and shrubs in oasis gardens. The first nest was found in an olive tree on 29 April 2011, in Siwa near Cleopatra's Spring. Further nests were found in April / May 2011 and again during our studies in May 2014. Data were collected for 16 nests in olive trees, 11 in date palms and one in a pomegranate *Punica granatum* bush (Figs. 22–25). A close relationship with irrigation channels, which in gardens are mostly in shade, chiefly free of vegetation, and sometimes lined with concrete, is plausible. Near one c.150-m long channel we found four nests, in some places just 20 m apart, but nests are also sited far from channels. What is remarkable is that nests are also sited near buildings and houses; one was just 5 m from a hotel. Tree nests are woven onto a twig with supporting side twigs, in a fork on a branch, or suspended between thin twigs. They are mostly sited above dry land in relatively open sites (in the shade of foliage) but also hidden in the canopy. Tree nests are sited 1.8–5.0 m above ground. Those in palm trees are generally fixed to the side of a leaf stalk, woven into the branching leaflets, and 2.5–6.0 m above ground, but it is probable that nests in palms are built at much greater heights.

Nest.—Compared to nests in reeds, those in trees are constructed of different materials, mostly bast fibres and dry grasses. The cups appear carefully constructed and are of varied shapes. Also used are spider webs, cocoons, animal hair, coloured string and occasionally thin plastic foil or paper. The foundation and outer wall are of coarser material, often with cocoons and gossamer woven in. The cup is of fine fibres. Measurements show no real difference to nests in reeds: outer diameter 6.1–8.0 cm, inner diameter 3.2–4.5 cm, depth of cup 3.0–4.5 cm, nest height 5.0–7.5 cm ($n = 14$). Nests found in old reeds, though most were in young reeds ($n = 8$) were no different in site, construction and material from those of other Eurasian and African Reed Warbler taxa. Six eggs had mean dimensions of 18.1×13.5 mm (range $17.3\text{--}19.1 \times 13.4\text{--}14.3$ mm). These are within the range of Eurasian Reed Warbler eggs, nor can any differences be observed in shape or colour (e.g. Schönwetter 1975, 1976, Schulze-Hagen 1991, Cramp 1992).

Breeding period.—Based on clutches and nestlings, the main laying period of the reed warblers in Siwa is probably late April / early May, with several mid-May observations of fledged or newly fledged young; only two nests still with eggs were found this late, while a female with quivering wings begging food from a male might indicate a second brood.

Behaviour

Activity.—Synchronous singing by males was heard in April–May, mostly at dawn and dusk, but sometimes in the extreme heat of midday and afternoon. For example, on 13 May 2015 several birds sang at 14.00–15.00 h, perched in the open, in windless conditions and 36°C, in the dead reeds at a salt lake in the west of the oasis. Interesting behaviour in very high temperatures of 42°C in the shade was also noted during midday at a nest of a freshly hatched brood. During changeovers between brooding the young, the adults were observed panting almost continually with heat stress (illustration in Hering *et al.* 2011a). An adult visited the nest twice with soaked belly feathers (presumably to cool the nestlings).

Foraging.—Reed warblers breeding in cultivation searched for food exclusively in oasis gardens, in the canopy of trees and palms where they gleaned invertebrate prey from leaves and twigs. There are definite parallels between their foraging behaviour and that of reed warblers on Pacific islands (e.g. Leisler & Schulze-Hagen 2011). Several times, reed warblers were observed searching for food in palm bast, moving down to c.1 m above ground.

Antagonistic behaviour.—Isolated observations were made of aggression between *Acrocephalus* and Eastern Olivaceous Warblers *Iduna pallida*, which are also common breeders in the oasis gardens. As a rule, reed warblers dominated, chasing other warblers out of their territory.

Discussion

Studies during recent years in Libya and Egypt have revealed that the biogeographical relationships of reed warblers in North Africa are complex (Hering *et al.* 2009, 2010a,b, 2011a,b, Winkler *et al.* 2013, in prep.). Based on current knowledge, we can postulate the existence of two separate phylogeographic units, each comprising sedentary and migratory forms. In central North Africa, and west as far as Iberia, breeders of the African *baeticus* complex (treated as a species by Kennerley & Pearson 2010) occur. Siwa Reed Warbler occurs in eastern North Africa, geographically and ecologically isolated in desert depressions. Further east, in the Nile Valley, Eurasian Reed Warblers of the race *fuscus* have recently been discovered to breed, as has the race *avicenniae* in mangroves of the Red Sea, including the first breeding in the Western Palearctic.

Divergence data are much too low to yield reliable molecular dating. However, very speculatively applying the often used 2% rule (Lovette 2004, Päckert *et al.* 2007) would suggest that the oasis warblers diverged from a possible *fuscus* relative rather recently, between 600,000 and 250,000 thousand years BP. This period would certainly suffice for evolving the morphological and physiological adaptations necessary to survive the extreme conditions in the isolated Siwa Oasis. The short wings of Siwa Reed Warbler probably reflect selection pressures also at work on oceanic islands (Leisler & Winkler 2015). Birds that attempt to disperse longer distances could end up in unsuitable habitats.

Wing length not only varies with the bird's structure but is also dependent on, for example, migratory behaviour. Intra- as well as interspecific comparisons have demonstrated that populations that migrate further have on average longer wings (Fiedler 2005, Förschler & Bairlein 2011). Consequently, in Eurasian / African Reed Warbler complex, taxa with the longest wings are the two breeding furthest north (*scirpaceus*, *fuscus*), while African taxa are shorter winged reflecting their different migratory behaviour.

Siwa Reed Warbler breeds in reedbeds and also, like island *Acrocephalus* species, in mainly dry habitat among shrubs and trees. This is remarkable, as until recently it was thought that the Eurasian / African Reed Warbler superspecies was stenotopic (restricted to a single narrow niche) in its choice of nesting sites. Accordingly, we must assume that *scirpaceus* is capable of a higher level of ecological plasticity in nesting sites than previously thought, from vertical structural elements in reedbeds to horizontal branches in the gardens of Siwa. Extensive date palm and olive tree gardens, with their multi-strata structure, effective shading, and rich prey availability, provide eminently suitable breeding habitat. Birds utilise all strata from low shrubs to canopy of date palms and olive trees.

Reed warblers can be evolutionarily successful in exploiting arboreal habitats because of pre-adaptations, such as a non-specialised foraging technique, excellent climbing abilities and the special way they attach their nests (see Leisler & Schulze-Hagen 2015). In addition, establishing a new niche in utilising trees for nest sites due to simultaneous absence of tree-dwelling competitors (though Eastern Olivaceous Warbler *Iduna pallida*

breeds sympatrically) has enabled high breeding densities. Adaptation of reed warblers to an 'island habitat' is an example of niche expansion. In this way, new foraging techniques could have developed (or be in the process of developing) in the crowns of palms and fruit trees.

What is striking is that a clear spatial separation exists between Siwa Reed Warbler and *A. stentoreus*. A dedicated search for the latter in the oases inhabited by *ammon* failed to find it. Given that *stentoreus* is strikingly large with a conspicuously loud song and calls (Cramp 1992, Kennerley & Pearson 2010), its occurrence can be excluded. Our field experiments in the oases of Bahariya and Dakhla, where Clamorous Reed Warbler is dominant, revealed that *stentoreus* almost always reacts immediately to playback of Eurasian Reed Warbler song by quickly approaching. While the more robust (compared to *ammon*) Eurasian Reed Warbler race *fuscus* nests in the Nile Delta and Valley alongside *stentoreus*, very recent studies reveal that the smaller *Acrocephalus* is clearly subordinate (JH unpubl.). This situation is doubtless comparable to the interspecific territoriality between Great and Eurasian Reed Warblers in Europe, with the larger bird dominating the smaller species and sometimes destroying its nests (e.g. Schulze-Hagen 1991).

It is remarkable that the reed warbler was not discussed in earlier publications on the avifauna of Siwa Oasis. In the few cases where an *Acrocephalus* was mentioned, no attention was paid to it subsequently (Al Hussaini 1937, Almond 1937, Moreau 1941, Goodman & Ames 1983, Goodman *et al.* 1986, Goodman & Meininger 1989). For example, it is probable that J. Omer-Cooper observed the species during the Armstrong College Zoological Expedition of June 1935. A species list contains the following remark: '? *Acrocephalus* sp. "A reed-warbler with fledged young" at Sitra t 5 vi (OC)' (Moreau 1941). This record was ignored subsequently, and another record on 9 May 1985 in the centre of the oasis near Aghurmi of a singing Eurasian Reed Warbler also failed to arouse suspicions (Goodman & Ames 1983, Goodman *et al.* 1986, Goodman & Meininger 1989). Apart from these observations, there is a complete lack of reference to the (undoubtedly common) Eurasian Reed Warbler in eastern Libyan Desert oases during spring or autumn migration (Goodman & Ames 1983, Goodman *et al.* 1986, Goodman & Meininger 1989). That the species does make migration stopovers in the region—probably frequently—is evidenced by our sight records and mist-netted individuals (nominate form $n = 10$) during April / May 2011 and May 2014. However, it must be noted that, apart from current research on the Libyan avifauna (e.g. Hering *et al.* 2009, 2010a,b, 2011a,b, 2012, 2013, Isenmann *et al.* 2016), there is a huge deficit in our knowledge of the Eurasian / African Reed Warbler superspecies elsewhere in North Africa and the Middle East (see Isenmann & Moali 2000, Isenmann *et al.* 2005, Jennings 2010).

The 'island' population of Siwa Reed Warbler presents excellent opportunities for investigations in the fields of evolutionary biology and genetics. Such a well-defined area is very well suited to become an open-air laboratory (see Eising *et al.* 2001). Exciting questions concerning ecology and breeding biology remain unanswered. For example, it is unclear if there is strict segregation between the reed-dwelling birds and those breeding in oasis gardens, whether there is interchange especially in the area of overlap between gardens and reed, and during which period the oasis gardens are occupied and how food-rich the reed stands are in the non-breeding season.

No threats to Siwa Reed Warbler are currently known. A change in the agricultural utilisation of Siwa Oasis and its traditional garden cultures, especially the growing of olive trees and date palms, seems unlikely. However, large fires such as that in February 2012, which destroyed >1,700 ha of agricultural land may cause considerable losses. Melioration as well as the burning and mowing of reed probably have little effect on the population.

Direct human predation (hunting, bird catching) was not recorded during our research. Potential natural predators such as Common Kestrel *Falco tinnunculus*, Black Rat *Rattus rattus*, feral cats *Felis silvestris catns* and Diadem Snake *Spalerosophis diadema* have been noted near nests, but probably have little effect on overall breeding success. The greatest natural threat to Siwa Reed Warbler would be if the dominant *A. stentoreus* should colonise the desert depressions. To what extent designation of the entire Siwa Oasis as a 'protected area' in 2002 (see Baha el Din & Sinibaldi 2002, Mikhail 2011) has had a positive impact on its fauna and flora cannot be judged due to lack of data.

Applying the Biological Species Concept of Mayr (1942), the less pronounced molecular differences indicate a very short period of divergence, while the overall very similar morphology and song types suggest that Siwa Reed Warbler is not a separate species, despite being ecologically and geographically isolated from other breeding populations of *A. scirpaceus* / *baeticatus*. Nevertheless, the occurrence of a second haplotype argues for two colonisation events separated by c.250,000 years, with the two subgroups subsequently merging. We consider that another quarter of million years of presumed isolation have not produced sufficient genetic and behavioural disparity that a new colonisation event by *A. scirpaceus* / *baeticatus* would leave two genetically isolated sympatric populations. The new taxon therefore qualifies for treatment at subspecies level. Moreover, the Eurasian / African Reed Warbler superspecies is still not understood in detail, e.g. the divergence between North African populations of *baeticatus* and those grouped under *scirpaceus* requires further study. So far, a well-established phylogeny based on extended DNA profiles for African races is lacking, while newly discovered reed warbler populations in Libya and Morocco might suggest that there is just a single species in North Africa (D. J. Pearson *in litt.* 2016), but an investigation of those birds in the central Sahara and Cyrenaica, where sympatry of *scirpaceus* and *baeticatus* has been reported, is needed. Given this, we have included the new taxon in the older established name *scirpaceus* (Hermann, 1804) rather than in *baeticatus* (Vieillot, 1817).

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Clarifying collection details of specimens from Champion Bay, Western Australia, held in the Natural History Museum, Tring

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SUMMARY.—Six bird specimens from Champion Bay (now Geraldton), Western Australia, were purchased by the British Museum from the dealer E. T. Higgins and registered in 1867. They included the first known specimen of Painted Finch *Emblema pictum* to have been collected after the holotype. All six specimens are of interest because their species are either rare or otherwise unknown in the Geraldton area. Widespread drought in the 1860s probably contributed to at least some of the unusual occurrences but cannot explain them all. Possible alternative locations for the specimens' origins are investigated. Biographical details of the probable collectors of the specimens, A. H. du Boulay and F. H. du Boulay, are explored.

In their review of Painted Finch *Emblema pictum* in South Australia, Black & Horton (2014) discussed observations made by Frank Gibson in the Flinders Ranges, South Australia, in 1868–69. They believed that his observations constituted the first record of the species since the collection of the holotype in June 1840, on Depuch Island in the Pilbara region of north-western Western Australia, by Benjamin Bynoe, surgeon to *HMS Beagle*. Gibson collected ten Painted Finch specimens in 1869, four of which are held in the Natural History Museum, Tring (Sharpe 1890). Black & Horton (2014) noted another specimen listed by Sharpe (1890), from Champion Bay (now Geraldton) in Western Australia, but they were unaware of its date of registration. The Champion Bay Painted Finch was in fact registered in 1867 and thus pre-dates the Gibson specimens. As it now is the first known record of the species after the holotype, the specimen is of considerable interest, and further details are desirable concerning its collector, its locality and any other material collected with it.

The Champion Bay specimens

The Painted Finch (Fig. 1) is one of a series of six specimens from Champion Bay, Western Australia (WA) (Fig. 2) purchased from Mr Higgins and registered on 25 February 1867 (Table 1). Edmund Thomas Higgins was a dealer in natural history specimens, living in London at the time (Sharpe 1906, Torrens 1994), and an agent for at least one other Australian bird collector, John Thomas Cockerell (PH unpubl.; Sharpe 1906). On the assumption that the specimens were shipped to England soon after they were collected, were about three months in transit, and were sold to the museum soon after reaching Higgins, they were probably collected no later than October 1866. In an age when it was difficult to keep insect pests at bay, and interesting natural history specimens from Australia were highly desirable in England, it is likely that the Champion Bay material was not collected much earlier, so the year of collection can probably be set at 1866. The register entries are rather scant, in three instances giving only the genus name, but all can be matched with entries in *Catalogue of the birds in the British Museum* (CBBM; see Table 1), with the exception of 1867.2.25.6. In the case of the Spinifex Pigeon *Geophaps plumifera* and Grey-crowned Babbler *Pomatostomus temporalis* specimens this permits identification to subspecies (Table 1) but unfortunately both specimens are missing and their identifications cannot be verified. The



Figure 1. Specimen of Painted Finch *Emblema pictum* from Champion Bay, Western Australia, NHMUK 1867.2.25.3 (© H. van Grouw, Natural History Museum, London).

Figure 2. Map of Western Australia showing localities and biogeographical regions mentioned in the text. Boundaries of the biogeographical regions are approximate.

Figure 3. Specimen of Letter-winged Kite *Elanus scriptus* from Champion Bay, Western Australia, NHMUK 1867.2.25.5 (© H. van Grouw, Natural History Museum, London)

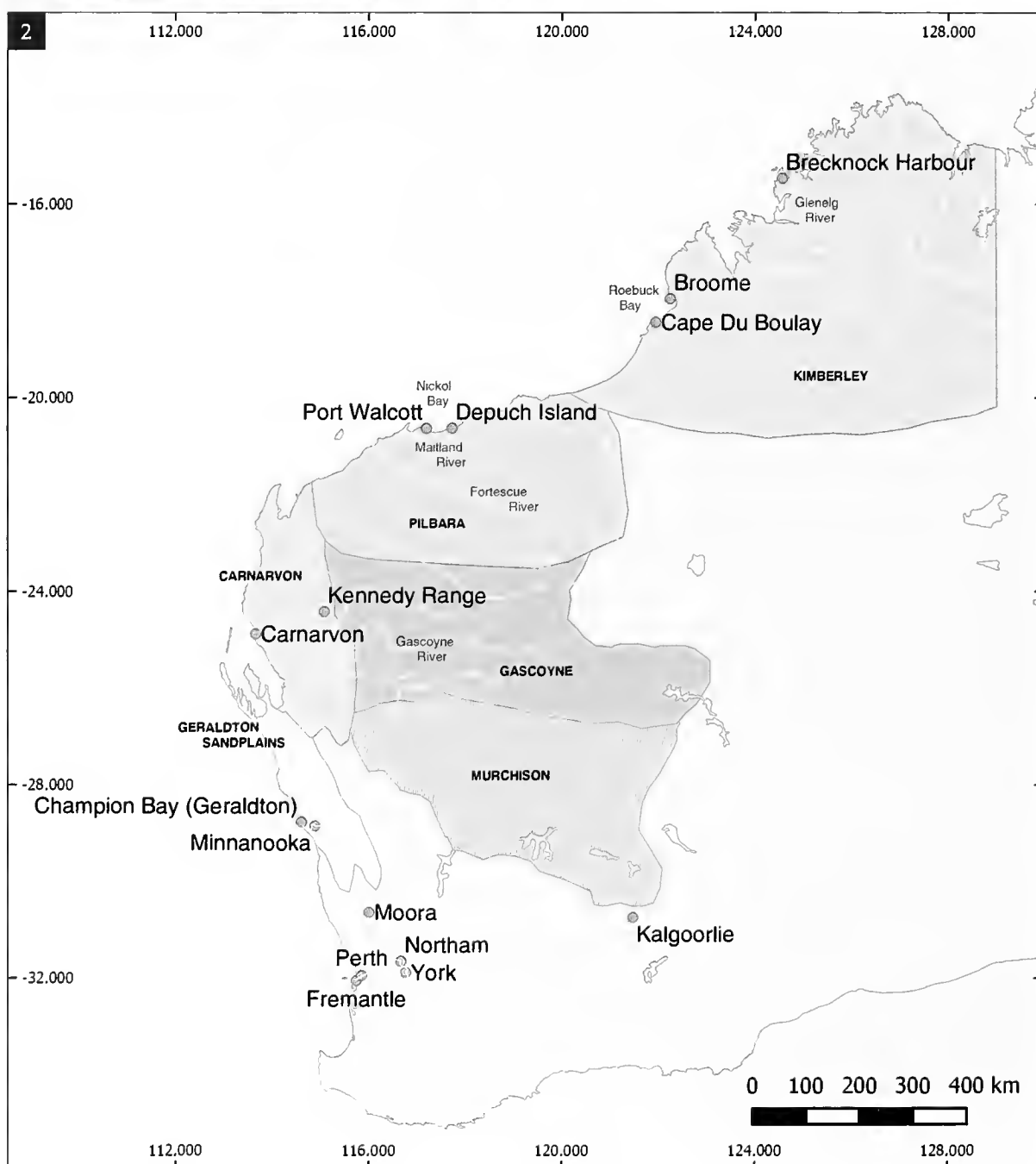


TABLE 1
The six Champion Bay specimens: details from the Natural History Museum, Tring, register and from the *Catalogue of the birds in the British Museum* (1874–98) (Cat. Birds BM). Ad. = adult; C. = collector; sk. = skin; st. = standing (mount).

Register no.	Name in register	Identification	Cat. Birds BM	Specimen
1867.2.25.1	<i>Lophophaps</i>	Spinifex Pigeon (rufous-bellied form) <i>Geophaps plumifera ferruginea</i>	Vol. 21 (Salvadori 1893: 534). Ad. st. A. H. Du Boulay [C.]	Missing
1867.2.25.2	<i>Pomatorhinus</i>	Grey-crowned Babbler <i>Pomatostomus temporalis rubeculus</i>	Vol. 7 (Sharpe 1883: 422). Ad. sk. Purchased.	Missing
1867.2.25.3	<i>Emblema maculata</i>	Painted Finch <i>Emblema pictum</i>	Vol. 13 (Sharpe 1890: 296). ♀ ad. sk. Purchased.	Skin; collector not given on label
1867.2.25.4	<i>Falco hypoleucus</i>	Grey Falcon <i>Falco hypoleucos</i>	Vol. 1 (Sharpe 1874: 394). ♂ ad. st. Purchased.	Relaxed mount; collector not given on label
1867.2.25.5	<i>Elanus inscriptus</i>	Letter-winged Kite <i>Elanus scriptus</i>	Vol. 1 (Sharpe 1874: 340). Ad. sk. Purchased.	Relaxed mount; collector not given on label
1867.2.25.6	<i>Ptilonorhynchus</i>	A bowerbird species? (possibly Western Bowerbird <i>Chlamydera guttata</i>)	?	Not found among the bowerbird collection

sixth specimen may have been a Western Bowerbird *Chlamydera guttata*, as this is the only bowerbird that occurs near the Champion Bay region (Johnstone & Storr 2004), but there is no Champion Bay bowerbird of any species either in the bowerbird collection or listed in CBBM, so its identity is unconfirmed. The three specimens that remain in the collection are of Letter-winged Kite *Elanus scriptus*, Grey Falcon *Falco hypoleucos* and Painted Finch. All six specimens are of interest because the species are rare or unknown from the Geraldton region; their possible provenance will be discussed below.

The collector

The only clue to the identity of the collector of the Champion Bay material is in the CBBM entry for the Spinifex Pigeon specimen, which Salvadori (1893) listed as having been collected by 'A. H. Du Boulay'. As specimen 1867.2.25.1 is missing, it is impossible to verify that it was indeed the specimen listed by Salvadori, but there were no others from Champion Bay in his list so it is almost certain that they were one and the same. None of the other Champion Bay specimens was listed with a collector's name, however, and none of the three surviving specimens has a collector's name on its label (Table 1). It is possible that Salvadori was aware of information concerning Du Boulay (or du Boulay) that Sharpe, who listed the other four specimens in CBBM, did not know. Sharpe (1906) noted the existence of the Champion Bay specimens in his account of Higgins, listing them together with ten specimens from Cape York, Queensland, also purchased from Higgins and registered in October 1867, but whereas he gave the collector for the latter (J. T. Cockerell), he did not for the former. Despite the lack of evidence, however, it is reasonable to assume that if du Boulay collected one of the specimens from Champion Bay, he probably collected or at least supplied them all. A search of museum and other records on the Atlas of Living Australia website (www.ala.org.au/data-sets/ accessed 20 July 2015) revealed no birds either from Champion Bay or collected by du Boulay. The earliest records from Geraldton are two

specimens (Red-backed Kingfisher *Todiramphus pyrrhopygius*, White-plumed Honeyeater *Ptilotula penicillata*) collected in 1899 by an unknown collector (probably Robert Hall) and held in Museum Victoria. Similarly, there are no records of birds from Champion Bay or collected by du Boulay in REJ's historical database (WA Museum), the earliest from Geraldton being two Rainbow Bee-eaters *Merops ornatus* and a Little Tern *Sternula albifrons* collected in 1896. It seems likely that the six 1867 specimens were an incidental collection made by an occasional collector, and several may have been targeted because they were unusual birds for the local area at that time. Who then was du Boulay?

Arthur Houssemayne du Boulay was born in Dorset, England, and baptised on 16 April 1843 (www.freebmd.org.uk/cgi/search.pl; www.search.ancestry.com.au/). Newspaper articles from the National Library of Australia's Trove website reveal biographical information, including that from the 1880s onwards 'du' was mostly used in his family name, rather than 'Du'. On 20 November 1862, Arthur du Boulay arrived in Perth from London and immediately sailed for Champion Bay (Anon. 1862b) where he joined other members of his extended family, who had already settled there. These included the brothers Julius and Francis Houssemayne du Boulay, who were Arthur's cousins (Anon. 1914a, 1922). Arthur became a pastoralist and assumed the lease of Minnanooka Station from his cousins (Anon. 1922); this is now only a place name (Minnenooka) c.25 km east-southeast of Geraldton (Fig. 2). On 10 March 1864 he joined an expedition led by Frederick Kennedy Panter to explore northern coastal WA (Panter 1864a,b). The expedition's chief naturalist was Dr James Martin, who had explored the Glenelg River area in the Kimberley region in 1863 (Anon. 1863, Martin 1865). The Panter expedition sailed to the Kimberley and spent three weeks at Brecknock Harbour, followed by three weeks in the vicinity of Roebuck Bay (Fig. 2), returning to Fremantle (Perth) on 6 June 1864 (Anon. 1864b, Panter 1864b,c). During the expedition, du Boulay made meteorological and other observations (Martin 1864a) and conducted a survey of Roebuck Bay and its environs (Martin 1864c). Cape Du Boulay, c.70 km south-west of Broome (Fig. 2), was named in his honour (Martin 1864d).

On 21 January 1867 Arthur du Boulay married Caroline Howard in Geraldton (Anon. 1867). At the time, however, the prospects for sheep farming were poor, due to continuing drought and low wool prices (Anon. 1922). That, combined with lawlessness in Geraldton (J. du Boulay pers. comm.), persuaded du Boulay to change profession. The newlyweds therefore returned to England where they lived from 1868 until 1874, while du Boulay studied law (Anon. 1922). In October 1874 the du Boulays, now with three children, returned to WA (Anon. 1874) and du Boulay established his practice as a barrister and solicitor in Geraldton (Anon. 1922). He remained at Geraldton for the rest of his life, dying on 18 June 1922 (Anon. 1922).

Provenance of the specimens

Although registered with the locality of Champion Bay (Geraldton), the six specimens may not have been collected there, as their species are rare or unknown in the vicinity, and in some cases occur in environments very different from the sandplains on which Geraldton is sited (Johnstone & Storr 2004). WA localities and regions given in the following summary of species distributions are shown in Fig. 2. Letter-winged Kite is usually restricted to a core range in the northern and eastern Lake Eyre Basin of inland Australia (Marchant & Higgins 1993), and Grey Falcon is rare, elusive and largely confined to inland regions (Schoenjahn 2013). The rufous-bellied form of Spinifex Pigeon occurs mainly in the Pilbara and mid-Gascoyne regions of WA (Higgins & Davies 1996, Johnstone & Storr 1998) some 350 km or more north of Geraldton. The southern edge of the WA distribution of Grey-crowned Babbler is closer to Geraldton but still some 150 km to the north-east (Higgins & Peter 2002,

Johnstone & Storr 2004). Painted Finch is common in the Pilbara (Johnstone *et al.* 2013) but the southernmost confirmed records in coastal WA are around Carnarvon and the Kennedy Range (Johnstone *et al.* 2000), some 400 km north of Geraldton; in the interior of WA the species is patchily distributed as far south as the Kalgoorlie district (Johnstone & Storr 2004). In WA Western Bowerbird occurs mainly in the Pilbara, Gascoyne and interior regions, but has been recorded further south (Johnstone & Storr 2004) including one sighting in sand-hill country near Geraldton, as reported by Ashby (1921).

Could any of these typically more northerly or inland species have been collected in the vicinity of Champion Bay, and even if so, where else might they have been obtained? Several possibilities are discussed below.

1. *Most of the specimens were collected near Champion Bay or Minnanooka Station.*—When populations of Letter-winged Kites' main rodent prey decline such as during drought, the kites disperse across much of the continent, as far as coastal WA (Marchant & Higgins 1993, Johnstone & Storr 1998). There was a severe drought across much of Australia in the mid 1860s (e.g. Anon. 1865b) and a naturalist 'Microzoon' writing in 1869 about the birds of Victoria noted that Letter-winged Kite was almost unknown in Victoria until 'the great drought a few summers ago' when it appeared in extraordinary numbers, together with many other inland species (Microzoon 1869b). The Champion Bay kite (Fig. 3) could have been collected during the same dispersive episode. A later dispersal was documented in October–November 1888 by Carter (1889) who observed large numbers of Letter-winged Kites in the Gascoyne region north of Geraldton.

Grey Falcon can occasionally appear in coastal regions, especially during or after droughts (Marchant & Higgins 1993). In WA Grey Falcon has rarely been recorded south of 26°S (Johnstone & Storr 1998, Schoenjahn 2013) so Champion Bay (Geraldton, 28°46'S) is an unusually southerly location. If it is correct then, like the kite, the falcon's appearance at Champion Bay was probably influenced by drought conditions. This is by no means the southernmost record of Grey Falcon in WA, however, the holotype having been collected in c.1839 near York (31°53'S) (Schoenjahn 2010). Other southerly records include historical sightings near Moora (30°38'S) and Northam (31°39'S) (REJ, WA Museum bird database; see Fig. 2 for localities). Noteworthy also is a Grey Falcon shot in Melbourne, Victoria, Microzoon (1869a) stating that the specimen was, by the time of his article, in the National Museum (of Victoria). This undated specimen (MV6358), possibly also collected during the 1860s drought, remains the only recorded occurrence of the species in the Melbourne district (Longmore 2012).

Painted Finch is capable of wide dispersal and irruptive movements (Higgins *et al.* 2006, Black & Horton 2014), and in WA is known to disperse, sometimes over hundreds of km, to flatlands during drought (Johnstone & Storr 2004). While there are no confirmed records anywhere near Geraldton (REJ, WA Museum bird database), it is feasible that the species could be a rare and brief visitor there. Like the kite and falcon, the appearance of the finch at Champion Bay or Minnanooka would probably have been drought-influenced, and indeed this may explain the appearance of Painted Finches in the Flinders Ranges in 1868–69, Gibson's observations being among the southernmost ever recorded (Black & Horton 2014). The sandplain habitat around Geraldton is far from typical for Painted Finch, which prefers spinifex (*Triodia*) in rocky hills and stony country (Johnstone & Storr 2004). The species has been recorded in atypical habitats, however, for example two clutches of eggs in the South Australian Museum (B2726, B14238) were laid in nests in tomato plants at the old police station at Illamurta Springs, Northern Territory, two birds were observed at Clayton Bore drain, Birdsville Track, north-eastern South Australia (Reid 2000), and Kovac

& Niejalke (2004) found the species breeding at a spring-fed wetland at Hermit Hill, south of Lake Eyre in central South Australia.

Grey-crowned Babbler is sedentary (Higgins & Peter 2002), so a specimen is unlikely to have been collected at least 150 km from the nearest known observation. In addition, the original sandy heath environments around Geraldton or Minnanooka would have been unsuitable for the species, which prefers open woodland with sparse ground cover (Higgins & Peter 2002). Du Boulay could only have collected the babbler further north or inland from Champion Bay. Spinifex Pigeon is also considered to be sedentary (Higgins & Davies 1996), occupying grasslands on rocky hills or stony flats (Johnstone & Storr 1998), so this specimen must have been collected hundreds of km north of Champion Bay where suitable habitat does occur. Western Bowerbird is usually found in rocky country or open riverine woodland but may occur in other habitats such as mangroves or homestead gardens (Johnstone & Storr 2004, Higgins *et al.* 2006). It is the only one of the six Champion Bay species for which there are other records in the vicinity, lending support for this locality, or Minnanooka, as the source of the bowerbird specimen.

2. *The specimens were collected during the 1864 Panter expedition.*—Given that the six species have more northerly distributions, it is reasonable to question if Arthur du Boulay collected the specimens in 1864 during the Panter expedition. Letter-winged Kite and Grey Falcon may occur at times in the Kimberley region, but are probably little more likely to be encountered there than at Geraldton. The rufous-bellied form of Spinifex Pigeon does not occur in the Kimberley, being replaced there by a white-bellied form, which does not occur in the coastal regions explored by the expedition (Johnstone & Storr 1998). Painted Finch is not known to occur in the Brecknock Harbour region of the Kimberley, but may occur in the vicinity of Roebuck Bay (Johnstone & Storr 2004), although the habitat encountered by the expedition there was mostly grassy plains with low open woodland (Martin 1864b,c), and atypical for the species. Grey-crowned Babbler does occur in coastal regions of the Kimberley, however, as does Great Bowerbird *Chlamydera nuchalis* (Johnstone & Storr 2004). Western Bowerbird does not reach further north than the Pilbara, so if du Boulay's unidentified bowerbird was collected in the Kimberley, it must have been a Great Bowerbird.

Natural history specimens were collected during the Panter expedition (Martin 1864a). Some of James Martin's plant specimens remain in the National Herbarium of Victoria (Atlas of Living Australia www.ala.org.au/data-sets/) and numerous butterflies and beetles were probably collected (Andrews 1864). However, there is no indication from Panter or Martin's reports that bird specimens were retained, many of those shot being destined for eating (Martin 1864d). It is also clear that Martin's bird identification abilities were limited as most were noted in generic terms, 'cockatoo', 'pigeon' etc., while others were wrong, e.g. Malleefowl *Leipoa ocellata* (of semi-arid southern Australia) and Superb Lyrebird *Menura novaehollandiae* (of wet forests in south-east Australia) that he reported in the Glenelg River district (Fig. 2) (Martin 1864b). Nonetheless, Martin was able to skin birds (Martin 1865), so if du Boulay didn't already know how to prepare specimens he may have had the opportunity to learn from him.

3. *The specimens were collected in the Pilbara region.*—All six species occur in the Pilbara region, although Letter-winged Kite only rarely does so (Johnstone *et al.* 2013). We have found no evidence of Arthur du Boulay having visited the Pilbara, as the Panter expedition did not stop there on either its outward or homeward journeys (Panter 1864b,c). However, it is possible that he made a private trip to the Pilbara for which there remains little or no documentation. He may even have travelled inland to the Gascoyne region south of the Pilbara, where all six species can also be encountered, although the logistical difficulties

of such a journey at that time would have been considerable and unlikely to have gone unnoticed in the press. Alternatively, Arthur du Boulay may have acquired Pilbara specimens from one of his cousins. Francis Houssemayne du Boulay (born England 1837, died Beverley, WA, 1914) was a naturalist and musician who specialised in collecting beetles in many parts of Australia (<https://familysearch.org/>; Anon. 1914a,b, Musgrave 1932). Reportedly, he went beetle-hunting on many occasions with Dr James Martin when both were still in WA, and he sent many of his WA collections to beetle specialists in England (Musgrave 1932). In January 1864 he sailed to England, the ship's cargo including '2 cases specimens Natural History', presumably his (Anon. 1864a); he returned to WA in September 1865 (Anon. 1865a).

In March 1866 Francis du Boulay joined Robert J. Sholl (Government Resident at Port Walcott, Fig. 2) in a 12-day expedition to the Maitland and Fortescue Rivers in the Pilbara (Sholl 1866), during which time Sholl named Du Boulay Creek, a few km east of the Fortescue River, almost certainly honouring Francis du Boulay. Sholl's (1866) description of the expedition indicates that they were constantly on the move and dealing with difficult terrain, straying horses and other events, so collecting of beetles, let alone birds, was probably minimal. However, Francis remained at Port Walcott for more than a month after the end of the expedition as he waited for the next ship home (Anon. 1866), and in that time may have collected a few birds, which he then could have handed to his cousin Arthur.

4. *The specimens were collected earlier by F. T. Gregory.*—Francis Thomas Gregory (1821–88) was a surveyor and explorer who undertook several expeditions in WA, some with his elder brother Augustus Charles Gregory, until he moved to Queensland in 1862 (Whittell 1946, Waterson 1972). In 1858 he led an expedition to explore the Gascoyne River district (Fig. 2), during which he encountered a 'new species of crested quail' (Gregory & Gregory 1884). He sent a specimen to John Gould who described it as *Lophophaps ferruginea* (Gould 1865), now *Geophaps plumifera ferruginea* (Spinifex Pigeon). In notes he sent to Gould, Gregory stated that he had 'found this species in large numbers on the Gascoigne River ... I have occasionally seen more than five hundred come down to drink in less than half-an-hour' (Gould 1865).

On 23 April 1861 F. T. Gregory sailed from Fremantle with a small party of volunteers and ten horses (Gregory 1862). Among the volunteers was Edward Brockman, a pastoralist and cousin of Francis du Boulay (Anon. 1861, 1902, 1914a). The ship called in at Champion Bay to pick up supplies and ten extra horses, including one supplied by Francis du Boulay; additional volunteers joined the party, but du Boulay was not among them (Gregory 1862). Arriving at Nickol Bay in the Pilbara region (Fig. 2) on 11 May 1861, the party spent the next five months exploring inland regions in two major expeditions, during which Gregory named several rivers including the Fortescue. Brockman was one of the hunters on the expedition, and Gregory (1862) noted on 26 May that 'Cockatoos and other game were plentiful, sixteen of the former being killed by Mr. Brockman at one shot'; the description indicates that the cockatoos were Little Corellas *Cacatua sanguinea*. While most of the birds shot were to supplement the men's meat ration, some were retained for 'our small collection of birds' (Gregory 1862). As on the 1858 expedition, the men again encountered 'crested quail or partridges', and Gregory described the method whereby local Aborigines captured large numbers of them at river pools.

The expeditioners left Nickol Bay on 23 October 1861 with the 14 surviving horses and, without stopping at Champion Bay, sailed directly to Fremantle, where they arrived on 9 November 1861. Whether or not Francis du Boulay's horse survived and was returned to him is unrecorded, but it is possible that Gregory may have given him some bird specimens as recompense. There would have been little opportunity for him to do so directly before

his departure for Queensland in February 1862 (Anon. 1862a), but Francis's cousin Edward Brockman could have given him some, which he later gave to his other cousin Arthur du Boulay. Gregory did send specimens to John Gould (Gould 1865) who described one of them as *Chlamydera guttata*, a new species of bowerbird (Gould 1862).

Discussion

It is impossible to determine the actual provenance of the Champion Bay specimens, but it is possible that they came from more than one source. Four of the six specimens could have been collected near Champion Bay or Minnanooka, but it is virtually impossible that the Spinifex Pigeon and Grey-crowned Babbler were collected there. However, the Panter expedition appears an unlikely source for most of the specimens. If the intention was to send the specimens to England for sale, it is probable that they would have been sent soon after collection, so material collected in 1864 could be expected to appear in England by 1865. Given the significance of the Kimberley location, because of its remoteness and the considerable public interest in the expedition at the time, it seems unlikely that the specimens would have been given a location of 'Champion Bay'. The dealer, Higgins, supplied J. T. Cockerell's specimens as from the equally remote location of Cape York, not Cockerell's home town of Brisbane; had the Champion Bay specimens been from the Kimberley, this surely would have been highlighted. Furthermore, only two of the six species are likely to have been encountered by the expedition.

The Gregory expeditions are a more probable source in that all species except the kite are likely to have been encountered and bird specimens, including two of the Champion Bay species, are known to have been collected. However, like the Panter expedition, if the specimens were intended for sale in England, it is more likely that they would have appeared there in the early 1860s, rather than 1867. In addition, if the kite, falcon, babbler and finch had been collected, Gregory probably would have sent specimens to Gould as a priority before sparing any for the du Boulays. They would have been of great interest to Gould had he known of them, but he made no mention of any specimens or information from Gregory for any of these four species; he only mentioned the pigeon and bowerbird, as well as other species that Gregory sent (Gould 1865).

The Champion Bay specimens may have been collected over several years, but it is more likely that they were collected over a relatively short period. The kite would almost certainly have appeared following the mid-1860s drought, so it is likely that all six birds were collected some years after the Gregory and Panter expeditions. From the point of view of timing, the Sholl expedition of 1866, and the month thereafter, seems more likely, and all six species could have been encountered in the Pilbara at that time. Francis du Boulay probably had ample opportunity after the Sholl expedition to collect birds in the vicinity of Port Walcott, and the abundance of Spinifex Pigeons encountered by the Gregory expeditioners indicates that du Boulay should have been able to collect at least that species with ease. The question remains as to why Francis would have given bird specimens to Arthur du Boulay to sell, especially as he was familiar with sending natural history specimens to England himself. More likely is that Arthur collected most or all of the kite, falcon, bowerbird and finch specimens near Champion Bay or Minnanooka, and Francis gave him at least the pigeon and babbler from the Pilbara, with all of the specimens then being bundled together and given the same locality. Another possibility is that Salvadori (1893) misread 'F. H. Du Boulay' as 'A. H. Du Boulay', and Francis collected all of the specimens, but as the only label bearing the du Boulay name was affixed to the Spinifex Pigeon that is now missing, this cannot be checked.

As a pastoralist in the Champion Bay district in the 1860s, Arthur du Boulay would have been well placed to observe the local avifauna and note any unusual occurrences. He would have learnt the value of collecting scientific specimens from his cousin and during the 1864 expedition. Further development of his collecting work would have been curtailed by his marriage and return to England in 1867–74, and pursuit of a new career. It seems highly likely that he and Francis du Boulay were the collectors of this remarkable suite of Champion Bay specimens, and quite likely that the collecting localities were the Champion Bay–Minnanooka area, and around the Fortescue and Maitland Rivers and Port Walcott in the Pilbara.

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Louis-Albert Necker (1786–1861) and Henri de Saussure (1829–1905)—two early contributors to the ornithological collection of the Muséum d’histoire naturelle de Genève

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SUMMARY.—The cousins Louis-Albert Necker and Henri de Saussure exemplify the contribution to the study of birds made by non-specialists in the first half of the 19th century, during the period when ornithology was just emerging as a scientific discipline. Necker undertook local field observations and published some of the earliest detailed information on the birds of Switzerland, especially the Geneva region, and both men were important contributors to the Muséum d’histoire naturelle de Genève in ways characteristic of their time: via the donation of private collections or the procurement of exotic specimens through scientific expeditions.

While not on the scale of museums in the great capitals, the Muséum d’histoire naturelle de Genève (MHNG) boasts one of the largest ornithological collections in Europe (Roselaar 2003). Two important early contributors were cousins, Louis-Albert Necker (1786–1861) and Henri de Saussure (1829–1905). Necker’s donation of more than 300 birds in 1819 was one of the collections from local *savants* that formed the core of the new institution, inaugurated as the Musée Académique in 1820. Saussure’s expedition to Mexico and the Antilles in 1854–56 added many new specimens, as did Aloïs Humbert’s expedition to Sri Lanka in 1858–60, and a donation from the East India Company of material collected in Java by Thomas Horsfield (Weber 1985). Subsequent contributions included the collections of Victor Fatio, Alfred Vaucher and Olivier Meylan, and specimens taken in the Philippines by William Parsons (see Baud 1976, 1978). The most recent major acquisition is the extensive egg collection of Werner Haller. Baud (1977) listed type specimens of 15 species, but many others have been recognised more recently (Weber 1985) and a new type catalogue is in production (Cibois *et al.* in press).

Though specialising in other fields—geology and entomology respectively—the cousins never lost their interest in ornithology, as may be seen from their correspondence, some of which survives in archives in Scotland and Geneva.

Louis-Albert Necker

On 27 March 1855 Necker wrote from Portree, on the Isle of Skye, to his cousin in Geneva, requesting specimens of ‘some of the brightest and most beautiful birds from Mexico’¹. It was just a whim, he remarked, as he was no longer really a collector. In fact, he was no longer active in science at all, having abandoned his old life due to ill health and sought refuge in his beloved Scotland, but in earlier years he had amassed a large collection of ornithological specimens, some local, others from Africa and South America. Many were lost or destroyed over the years (Necker 1916), but current holdings at MHNG include 33 specimens from Necker’s donation, four of them displayed in the public galleries (Hollier *et al.* 2015). He also published some of the earliest detailed information on birds in Switzerland, especially the Geneva region.

¹ L.-A. Necker to Henri de Saussure, 27 March 1855: Bibliothèque de Genève, Archives de Saussure 245.

Swiss ornithology commenced with the pioneering work of Conrad Gessner (1555), although his approach was universal and intended to cover all known species. His descriptions are often vague or inaccurate, and sometimes separate the two sexes as different species; nevertheless, many species, particularly those of which he could make direct observations, are still identifiable, and Linnaeus assumed many of his Latinised names meaning they are still in use (see Haffer 2007). Virtually nothing was known of the Swiss fauna at the beginning of the 19th century (Maumary *et al.* 2007: 60). There were no equivalents of Gilbert White or Thomas Pennant in 18th-century Switzerland, and pioneering Alpinist Horace-Bénédict de Saussure (the cousins' grandfather) mentioned only a few bird species in his natural history of the Geneva region (Saussure 1779, 1786). The first list of Swiss birds (Meisner 1804) was a checklist with the synonymies of various authors' nomenclature indicated. Thereafter, Meisner & Schinz (1815) presented brief descriptions and some information concerning the distribution and habits of species known from Switzerland. Necker had already read a 'Mémoire sur les oiseaux de la Suisse' at the Société de Physique et d'Histoire naturelle de Genève in 1813 (Sigrist 1990), and he published an early supplement to the Meisner & Schinz list (Necker 1818b), adding several vagrants, e.g. Caspian Tern *Hydroprogne caspia* and Western Orphean Warbler *Sylvia hortensis*, normally a Mediterranean species, which he reported breeding near Geneva.

Necker kept quite detailed ornithological notes based on his own field observations, as well as specimens and information provided by others, and records of birds found on the market stalls of Geneva. Some of these were published posthumously (Necker 1916). He produced the first list of the birds of Geneva, providing scientific and common names, and an indication of migratory status and rarities (Necker 1817). This was subsequently published in English, such information being useful for comparison but 'little known to British naturalists' (de la Beche 1824). His main ornithological work was a much more extensive survey of the birds of Geneva, with a discussion of those resident in the region (separating taxa associated with the lowlands, mountains, lakes, etc.) and their assemblages, and a calendar of migrants, both summer and winter (Necker 1823). The work was of sufficient interest to be abstracted in the *Edinburgh Journal of Science* (Anon. 1826). According to the introduction, he had been observing birds around Geneva for 20 years; if so, he must have started before his first trip to Scotland at the age of 20.

Necker spent two years at Edinburgh University in 1806–08, pursuing his main interest, geology. He took the opportunity to travel around Scotland, primarily seeking evidence for the competing geological positions in the ongoing Huttonian–Wernerian debate (Eyles 1948), but also observing landscape, society and manners. The published account of his travels (Necker 1809, 1821a)² covered a variety of subjects and included remarks on birds, although most of the natural history content was geological. Rixson (2011) commented unfavourably on Necker's ornithological skills because he reported seeing penguins in the Hebrides, but the error was clearly the translator's rather than Necker's: *pingouin* being French for auk (Alcidae, of which several species breed in Scotland), while *manchot* designates penguins (Spheniscidae).

Necker returned to Geneva following his studies, becoming assistant professor (1810–17), then honorary professor (1817–35), of mineralogy and geology at the Académie de Genève (now the university). He was active in helping to found the museum, giving one of the public lectures that helped finance the project (his topic was birds) as well as donating specimens (Hollier *et al.* 2015). Although he published no taxonomic work, Necker was a firm advocate of the need to observe birds in life as the basis for accurate identification and

² Two English translations of part of the latter work appeared under his name (Necker 1821b, 1822) although they were not necessarily authorised.

description of species, noting that behaviour and differences in plumage between juvenile and adult, the sexes, and also between seasons make taxonomy difficult (Necker 1818a). This was quite farsighted, as ornithology tended to be divided into field and systematic schools with little overlap until the early 20th century (Haffer 2007, 2008). His insistence on field notes, rather than relying on memory to write them up later, also strikes a modern note.

From 1829 ill health obliged Necker to curtail his scientific activities, which had included mineralogical research and extensive geological investigations in the eastern Alps. Declining the offer of a full professorship in 1835, he took to spending his winters in Scotland. Based mainly in Edinburgh, he also visited Arran, the Shetlands and Orkney; extracts from letters to his mother, Albertine Necker de Saussure (1766–1841), reveal his continuing preoccupation with natural history (Necker 1840). Strolling on the beach on Arran he was moved to try out skills unused for 20 years, skinning and stuffing a mackerel and then an auk, ‘reviving, as Mme de Staël used to say, my taste for dissecting my friends’³. He settled in Portree, on the Isle of Skye, in April 1841. After the death of his mother in the same month, he severed almost all contact with his former life in Geneva. By the 1850s, however, he was once again in touch with friends and family, and glad to receive visits from some of his young relatives. One of these was Henri de Saussure, a cousin, although 43 years his junior.

Henri de Saussure

When Necker wrote in 1855 requesting bird specimens from Mexico, Henri de Saussure had already arrived there, realising at the age of 24 his ambition to undertake an expedition to Mexico and the Antilles. Following studies at the universities of Geneva (1850) and Paris (1852), and a doctorate from the University of Giessen in 1854, he was already beginning to specialise in entomology, but the aims of his Mexico trip were very broad. He consulted the great explorer Alexander von Humboldt, who offered advice and asked him to make a particular study of the volcanoes and bring back rock samples for study in Europe. This was more the domain of Saussure’s elder cousin, who also offered good advice. Before giving detailed instructions on geological recording, and after warnings to take great care of his health (a Scottish plaid was one suggestion for protection against the cold), Necker enjoined his cousin to take copious notes, trust nothing to memory, and to be sure to draw and note exactly what he saw, unprejudiced by theoretical preconceptions.

Saussure was accompanied by his friend Henri Peyrot, by François Sumichrast (a naturalist from Vaud who acted as scientific assistant) and by the family gardener Marc Grosjean as factotum (Hollier & Hollier 2012). Although the dangers and difficulties caused by civil war obliged him to depart Mexico without visiting all of the places he had intended, the expedition provided numerous specimens for the museum. These were augmented by Sumichrast, who chose to remain in Mexico and eked out a poor living from teaching, farming and supplying specimens to museums in Europe and the USA. Reptiles and birds were his main interest; *Cyanospiza rositae* Lawrence, 1874 (Rosita’s Bunting, or Rose-bellied Bunting) was named for Sumichrast’s wife by one of his main customers, George Newbold Lawrence. Sumichrast also discovered many new invertebrate species, a large number of which were described by Saussure. Necker’s requests to buy specimens in the years after 1855 were at least partially motivated by a generous wish to assist Sumichrast, who soon fell on hard times in the chaos of the Mexican civil war and its aftermath.

³ Letter 17 May 1839. Necker’s mother Albertine, the eldest child of Horace-Benedict de Saussure, was a cousin and close friend of Madame de Staël, and wrote a short biography of her (Necker de Saussure 1820).

Saussure was a prolific taxonomist and described some 3,500 arthropod species, principally in the insect orders Hymenoptera and Orthoptera (*sensu lato*), but with substantial contributions in Crustacea and Myriapoda (Hollier & Hollier 2013). He also described 23 vertebrate species, including three birds (Saussure 1859b). Two were from Mexico and the other from the Antilles; their type specimens are all at MHNG (Hellmayr 1942, Baud 1977, Cibois *et al.* in press).

Falco ferrugineus Saussure, 1859, is a junior synonym of *Falco sparverius sparveroides* Vigors, 1827, a subspecies of American Kestrel, but the name *F. ferrugineus* is in any case a junior homonym of *F. ferrugineus* M. H. C. Lichtenstein, 1838. Saussure stated in the original description that he shot the specimen on Saint-Domingue (=Hispaniola) but the label gives the locality as Cuba (Hellmayr 1942).

Acanthylis semicollaris Saussure, 1859, now White-naped Swift *Streptoprocne semicollaris* (Saussure 1859). The original description did not mention a precise locality, stating only that the species lives in the large forests of Mexico.

Quiscalus sumichrasti Saussure, 1859, a junior synonym of Melodious Blackbird *Dives dives* (Deppe 1830). This species is sometimes also known as Sumichrast's Blackbird, commemorating Saussure's travelling companion. The original description did not mention a precise locality, stating only that the species is from Mexico and that the locals called it the 'otcho'.

Specimens from Saussure's expedition were exchanged with other museums; the *Comptes Rendus de l'Administration Municipale* for 1857 (Anon. 1858) recorded exchanges with the museums of Neuchâtel and Strasbourg, while an exchange with the British Museum is demonstrated by the fact that *Geothlypis speciosa* P. L. Sclater, 1858, was described from specimens collected by Saussure. There are currently 180 bird specimens from the expedition in the MHNG collection (L. Vallotton to J. Hollier pers. comm.).

Conclusion

Though cousins, the large age gap between Necker and Saussure meant the relationship was more that of uncle and nephew. Saussure's father Alphonse (the youngest son of Horace-Bénédict de Saussure) had been one of the companions of Necker's active ornithological days, providing him with observational data and specimens, including a Lammergeier *Gypaetus barbatus* (see Necker 1916). Necker gave Henri de Saussure much good advice both before and after his Mexican expedition. It is perhaps due to Necker's influence that Saussure's only publications concentrating solely on observations of behaviour and morphology were those of Mexican birds (Saussure 1858a, 1859a). Saussure emulated Necker in mixing field and systematic ornithology in a fashion unusual for the era (Haffer 2008). The confusion and paucity of locality data in Saussure's descriptions of birds appear to indicate that Necker's advice was not sufficiently adhered to, but there is evidence that Saussure did keep more detailed notes (Weber & Roguin 1983), and it is perhaps notable that very cursory descriptions and localities in some of Saussure's publications were followed by monographs containing much more detailed information (compare, for example, Saussure 1858b, 1860).

Necker was generally appreciative of Henri de Saussure's scientific work. This stemmed, in part, from family pride, but he did not hesitate to criticise where necessary; he was less critical of the ornithological work than of Saussure's forays into the geology encountered on his expedition⁴. Following the death of his cousin, Saussure wrote an obituary (Saussure 1861). He made special mention of Necker's ornithological works, and

⁴ Saussure's ornithological work also received a positive contemporary review from Des Murs (1859).

called for the Geneva memoir to be reprinted. When it was republished (Necker 1864), a translation of J. D. Forbes' life of Necker (Forbes 1863) was added⁵; in the circumstances, it seems possible that the translation was by Saussure. It is apparent from the obituary that Saussure thought Necker had been gathering material for a work on northern birds during his time on Skye, but nothing was ever published. Saussure never worked on birds again following the death of his cousin.

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⁵ James David Forbes was a geologist and glaciologist who became one of Necker's close friends in the later part of his life (Hollier *et al.* 2015).

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First record of Crested Honey Buzzard *Pernis ptilorhynchus* for Kenya and East Africa

by Adam Scott Kennedy & Rhys M. Marsh

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Crested Honey Buzzard *Pernis ptilorhynchus* is a widespread Asian raptor with both resident and migratory populations across its extensive range. The migratory subspecies *P. p. orientalis* breeds from southern Siberia east to Japan and North Korea, and spends the non-breeding season in southern and South-East Asia, while typically sedentary populations of the other five subspecies (*P. p. ruficollis*, *P. p. torquatus*, *P. p. ptilorhynchus*, *P. p. palawanensis* and *P. p. philippensis*) breed from India east to the Greater Sundas and the Philippines—a range that roughly mirrors the non-breeding range of *P. p. orientalis*. The species has attracted much interest among Western Palearctic birdwatchers in recent decades, following its discovery on migration in Turkey in autumn 1979 (Laine 1996), subsequently at the Chokpak Pass, Kazakhstan, since 1993 (Forsman 1994) and, most recently, even Cyprus (Harrison 2014) and southern Italy (Scuderi & Corso 2011). It is now considered an uncommon but regular passage migrant and winter visitor to the Middle East, where perhaps at least 100 individuals overwinter each year, mainly in Oman, Saudi Arabia and the United Arab Emirates, but with records from most states (Babbington & Campbell 2016, Forsman 2016). There has been speculation as to the numbers of Crested Honey Buzzards that might straggle to Africa within flocks of migrant European Honey Buzzards *P. apivorus*, especially given the volume of records in Israel (Alon *et al.* 2004, Koss *et al.* 2008). However, there have been just three records from the continent including just one in sub-Saharan Africa: Egypt, May 1996 (Baha el Din & Baha el Din 1997), Gabon, August 2004 (Clark & Christy 2006) and Sudan, June 2011 (T. Jenner; www.africanbirdclub.org/afbid/search/browse/species/234).

On 26 September 2014, RMM photographed an adult female Crested Honey Buzzard in Meru National Park, Kenya (00°12'32"N, 38°03'30"E). The bird was observed flying over farmland adjacent to *Acacia-Commiphora* scrub typical of the region. It was always at least c.250 m from RMM, who managed to take eight photographs (e.g. Figs. 1–2) during the c.1 minute the bird was visible before it was lost from view. This record is the first for Kenya and East Africa, and the second for sub-Saharan Africa.



Figures 1–2. Crested Honey Buzzard *Pernis ptilorhynchus*, Meru National Park, Kenya, 26 September 2014 (R. M. Marsh)

The bird was identified during a chance review of the photographs by ASK, who realised that all of the visible features were clearly consistent with *P. ptilorhynchus*. While the bird's structure is similar to *P. apivorus*, it is noticeably bulkier with a large broad tail and bulging trailing edge to the wing. The wings also show six emarginated primaries which, combined with structure, is one of the most notable features of *P. ptilorhynchus* (Ferguson-Lees & Christie 2001, Svensson *et al.* 2009, Forsman 2016). The underparts and underwing-coverts are mostly tawny rufous-brown with cream-coloured barring. The carpal region is slightly darker but lacks the diagnostic dark or blackish patch of *P. apivorus*. The inner secondaries show two well-defined bars and the outer secondaries and inner primaries possess three bars. The emarginated primaries are also barred beyond the emarginations, unlike *P. apivorus*, which typically shows solid black feather tips. The undertail pattern consists of one heavy band close to the tip, one clear band beyond the undertail-coverts and one less obvious band at the base. The head is mostly pale creamy grey with a dark streak through the eye. A conspicuous dark collar and dark mesial streak are visible. The cere appears greyish and the irides yellow. Other than the upperwing, the upperparts are not visible on any of the images.

While *P. apivorus* is the sole *Pernis* expected on the African continent, this observation confirms that Crested Honey Buzzard does, at least occasionally, migrate to or through East Africa and that European Honey Buzzards should be carefully scrutinised for the species.

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Territorial and courtship displays of Mauritius Cuckooshrike *Lalage typica*

Myles M. Lamont

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Mauritius Cuckooshrike *Lalage typica* is endemic to the island of Mauritius and forms a superspecies with Réunion Cuckooshrike *L. newtoni*. Both species are globally threatened: *L. typica* is considered Vulnerable based on its small range and population size, last estimated by C. G. Jones at 300–350 pairs (BirdLife International 2012), and *L. newtoni* Critically Endangered (BirdLife International 2015).

My observations of Mauritian Cuckooshrike were made in Black River National Park, Mauritius, between October 2013 and February 2014. One of the few displays known in this species was reported by Cheke (1987) and Safford & Beaumont (1996), involving adult males, and referred to as ‘aerial duels’, summarised as ‘up to 4 birds chase around or over the forest before returning to their own territories’ (Safford 2013). I observed this behaviour on three occasions but can add some further details.

The first observation occurred while watching Echo Parakeets *Psittacula eques* from above the canopy on the morning of 9 November 2013 in the Brise Fer area. Multiple males were heard calling and then three were seen to gather c.45 m above the valley bottom and c.30 m above the forest canopy, before they began to fly in partial unison, mimicking one another’s flight patterns, in a somewhat circular fashion, while emitting the typical harsh *kek* call. They continued to lightly pursue one another, twirling upwards, without any particularly dominant bird taking an aggressor role, and occasionally hovered while flying around one another. No physical contact occurred and there was no obvious aggression as one would expect from a male chasing another male from its territory, rather the behaviour seemed more akin to an aerial contest or display of fitness, rather like a tok (described by Tuck 1972 as the aerial equivalent of a lek), which has previously been used to describe displays in snipe (Tuck 1972, Sutton 1981) and Lyre-tailed Nightjars *Uropsalis lyra* (Hilty & Brown 1986).

Thirty minutes later, playback of the male territorial call triggered the same behaviour, with another three (presumed) males rising into the air, repeating the previously observed behaviour. The third observation occurred on 13 November shortly before dusk, in the same location, and starting again from the same emergent tree. On this occasion, three birds rose into the air unprovoked, but only two continued with the aerial display for c.1 minute, before flying over a ridge and out of sight. Aggressive aerial chases of intruding males from one territory to another through the canopy were seen multiple times, and were clearly very different from the aforementioned observations. It should be noted that without a vantage above the canopy, these behaviours would have been very difficult to observe from the ground, unless stationed on a ridge or elevated road with few visual obstructions.

The only description of potentially similar behaviour in this family were those made by Skead (1966) of male Black Cuckooshrike *Campephaga flava* partaking in an ‘excited fluttering moth-like flight near female’. Dueling or aerial lek behaviours in the Campephagidae as a whole does not appear to have been reported in the literature (Keith *et al.* 1992, Taylor 2005).

Likewise, a review of published literature failed to reveal any previous descriptions of courtship behaviour in Mauritius Cuckooshrike (R. Safford *in litt.* 2015). On 23 November 2013, at c.06.00 h, a female cuckooshrike was heard in Brise Fer, c.10 m from the main track,

in a recently cleared guava plot. The female was seen first, and shortly afterwards the male. The birds were within a known territory and the observations were made c.40 m from a nest discovered a few days later. They were noticed due to the unusual noise they were making and the following performance was made on a horizontal guava branch c.3 m above ground. The female was squatting, performing a slow wing bate every few seconds while emitting a soft single-note call in sequence with each wingbeat. Her hunched posture was similar to that of the pre-copulatory or solicitation position in other birds. The male began to perform a simple lateral display, standing taller, tilting the entire body and slightly raising the opposite 'shoulder' to fully display its mantle to the adjacent female. The male then began to jump sideways over the female every 5–10 seconds, bobbing its tail with partially drooped wings, while emitting the same call as the female but slightly louder. The male remained parallel to the female, with neck extended and head pointed towards her, and its bill only a few cm away from his partner's. The parallel posture and head-pointing was maintained while leaping back and forth over the female. This continued for c.1 minute, thereafter the female flew 20 m to another perch close above ground, where the behaviour continued for a further 1–2 minutes. Although copulation was not observed, it possibly occurred beforehand or shortly after when the pair flew to the second perch, as observation was constrained by dense vegetation. Horne (1987) noted soft calls during copulations (<https://macaulaylibrary.org/audio/72108>).

On 23 December 2013 in Brise Fer a juvenile cuckooshrike was seen feeding in a cleared guava plot within a few hundred metres of where the courtship behaviour occurred. The bird was foraging from 2 m above ground to the canopy c.10 m high. The juvenile was observed taking bush crickets and other invertebrates gleaned from the bark and leaves of the endemic trees it was foraging in. An adult female brought food to the juvenile every few minutes and the juvenile chased and begged for food before and after being fed, but searched for food alone otherwise. The juvenile appeared undisturbed by my presence and fed within a 30 m radius of where it was initially seen for six days. Although the male remained close by, it was not observed feeding the juvenile insects, although previous observations have documented both adults feeding young (Safford & Beaumont 1996). The juvenile was estimated to have fledged c.2 weeks previously.

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The May 1924 Meinertzhagen record of cranes over London

by Robert P. Prŷs-Jones & Nigel J. Collar

Received 7 March 2016

In his summary of Common Crane *Grus grus* records for London, the first to be deemed acceptable by Self (2014) was from '1924: Kensington, flock heard at night on 8 May'; the next acceptable record is not until 1973. Reference to the Committee of the London Natural History Society (1957), which also accepted the May 1924 record, reveals the person responsible to be Richard Meinertzhagen, who had published it in an article relating to the seven-acre Kensington Park Gardens. Meinertzhagen (1942) recorded that:

'...one of the most remarkable records for the garden, if not for London, occurred about midnight on May 8th, 1924, when my wife and I were returning from a theatre in a white fog. The unmistakable call of crane was heard, not one but many, passing over at a great height. So penetrating is this call that when migrating it can be heard long before birds come into sight. ... This fine bird, which once bred regularly in the British Islands, doubtless passes over Britain more regularly than is generally realised.'

This record is indeed remarkable, as on that date Meinertzhagen and his wife were engaged in a collecting trip to Madeira, where they arrived by boat on 29 April and departed on 22 May (Meinertzhagen 1925). Although the year of this visit is not mentioned in his paper, Cocker (1989) gave it as 1924 and a check of >30 specimens of species referred to as taken on the trip, now held in the Natural History Museum, Tring, confirms this.

Regarding UK weather for May 1924, 'The number of days of fog during the month was small' (Meteorological Committee 1924). More specifically, the detailed weather register for the South Kensington area for 8 May notes 'Clear night' (Met Office National Meteorological Archive *in litt.* March 2016).

Although our grounds are different, we are not the first to have reason to doubt this record. Among the London Natural History Society bird record cards (now preserved as electronic scans) was one by 'RCH' (almost certainly R. C. Homes) that referred to Meinertzhagen (1942) and stated:

'In conversation with R.S.R. Fitter at Upsala [*sic*] in June 1950 Col. Meinertzhagen said that cranes normally make a direct flight on migration from Spain to Sweden. The ones heard over London were definitely *Grus*, and not demoiselle or sarus, but might possibly have been escaped specimens of one of the Asiatic species of *Grus*. Note: the latter seems unlikely as several birds were heard and in view of Col. Meinertzhagen's experience there seems no reason to doubt his identification of the species, though in the case of such an

unusual record the fact of the birds not being seen suggests square brackets.’ (Record Set 1900 to 1950. Record 00003067. Held by Greenspace Information for Greater London.)

Despite being chairman of the Committee of the London Natural History Society, Homes was evidently in a minority on the need for square brackets when it came to publication. Subsequently, however, Naylor (1996) placed the record in square brackets, based on wider doubts concerning Meinertzhagen records flagged up by Knox (1993).

It is of course possible that Meinertzhagen simply got the date wrong, but his now well-established deceptions involving bird specimens (Knox 1993, Rasmussen & Collar 1999, Rasmussen & Prŷs-Jones 2003) clearly also carried over into his published anecdotes. For example, his assertion that he observed Raso Lark *Alauda razae* in the field (Meinertzhagen 1951) is demonstrably untrue (Collar & Stuart 1985), while his claim to have been in a position to assassinate Adolf Hitler on 28 June 1939 (Meinertzhagen 1959) has been exposed as fabrication (Garfield 2007). In the circumstances, therefore, we recommend that this record of *G. grus* be deleted from the London list. However, it should be noted in passing that Meinertzhagen’s (second) wife, the ornithologist Annie Jackson, is in no way implicated regarding this record, as she died in 1928.

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We are greatly indebted to David W. Allen for bringing both Meinertzhagen (1942) and the entry in the London Natural History Society records to our attention. Our weather query to the Met Office received an extraordinarily efficient response from their Weather Desk and National Meteorological Archive, for which we are most grateful. Leo Batten and Guy Kirwan commented usefully on the submitted draft.

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First record of Northern Gannet *Morus bassanus* in the Southern Hemisphere

by Régis Siqueira de Castro Teixeira, Roberto Otoch & Marcos A. Raposo

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According to the literature (e.g. Cramp & Simmons 1977, Nelson 1978, Carboneras *et al.* 2016), Northern Gannet *Morus bassanus* breeds on both sides of the North Atlantic Ocean, between 48°N and 72°N on the east side, reaching north to Norway, whereas in the west it nests only between 46°N and 50°N. Carboneras *et al.* (2016) noted that winter movements regularly reach as far south as Mauritania and Senegal (including birds breeding in Canada), exceptionally Guinea-Bissau (Borrow & Demey 2001), as well as entering the Mediterranean via the Strait of Gibraltar east to Israel and Turkey, and in the western Atlantic south to Florida and the Gulf of Mexico. In the Caribbean Basin, there are records from the Bahamas (Raffaele *et al.* 1998), Cuba (Fox & Fox 2007) and Trinidad & Tobago (Kenefick 2010).

On 13 February 2016, during field work at the border of the municipalities of Fortim and Beberibe, in Ceará, north-east Brazil (04°22'56"S, 37°50'50"W), RSCT found an adult Northern Gannet on the rio Pirangi, very close to its mouth. The bird was floating c.20 m from RSCT but then flew away, preventing very good photographs, although those obtained are sufficient to identify the species (Fig. 1). In one image (Fig. 2) it is possible to see some palms in the background that we tentatively identified as *Copernicia prunifera* (Mill.) known in the region as 'Carnaúba'; this, together with the GPS stamp on the images (seen by our referees), validate the record.

The wing pattern visible in Fig. 2, with all-white secondaries and black wingtip feathers (primaries and their coverts) being diagnostic. Together with the buff head and white body and tail, these characters make the bird's identification unequivocal. Unsurprisingly,



Figure 1. Head and wing of Northern Gannet *Morus bassanus*, rio Pirangi, Ceará, Brazil, February 2016, showing the diagnostic wing pattern (Régis Siqueira de Castro Teixeira)



Figure 2. Northern Gannet *Morus bassanus*, rio Pirangi, Ceará, Brazil, February 2016, showing the diagnostic white rectrices, with 'Carnaúba' palms *Copernicia prunifera* in the background (Régis Siqueira de Castro Teixeira)

this record was made during the Southern Hemisphere summer, i.e. during the Northern Hemisphere winter, when the species is known to move south.

Records like this are presumably very rare. The fact that the species is unexpected in the region, its resemblance to other species such as Red-footed Booby *Sula sula* and Cape Gannet *Morus capensis*, and its absence from the better-known guides to South American birds (e.g. Murphy 1936, Ridgely & Greenfield 2001, Restall *et al.* 2006), could also explain the lack of previous records for mainland South America.

Other Sulidae previously recorded in Brazil are: *Morus capensis*, Australasian Gannet *M. serrator*, Masked Booby *Sula dactylatra*, *S. sula* and Brown Booby *S. leucogaster* (Piacentini *et al.* 2015).

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